SOCIAL SCIENCES

INDUSTRIAL MEDICINE

The Journal of Occupational Diseases and Traumatic Surgery

S24141

September, 1941

Silicosis
— Silicosis with Tuberculosis —

Ethylene Dichloride Poisoning
— Report of Two Cases —

Pre-existing Disease
— Aggravation as a Result of Compensable Injury —

Respiratory Infections
— Their Control in Industry —

Occupational Dermatoses
— Diagnosis, Prevention and Treatment —

Industrial Health Practices
— The N.A.M. Survey of 2,064 Industrial Establishments —

National Defense
— And Occupational Disease —

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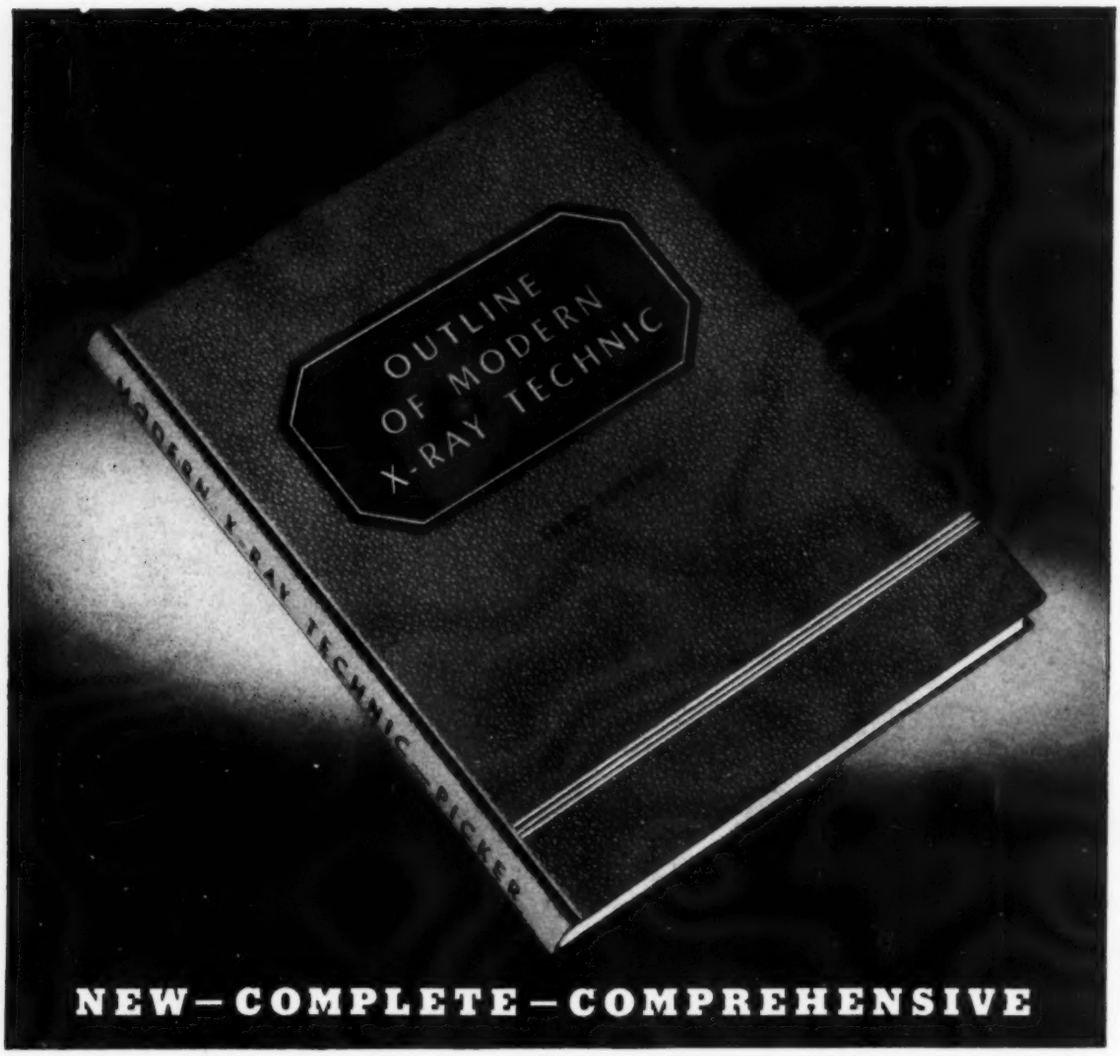

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THE N.A.M. survey of industrial health practices throughout the United States, conducted under the direction of DR. VICTOR G. HEISER, consultant to the Association's Committee on Healthful Working Conditions, and distributed in May, 1941, is the first survey of its kind covering every size and type of manufacturing industry and, at the same time, achieving nation-wide geographical representation. The rather extensive questionnaire was answered from all of the states except North Dakota and from the District of Columbia. In number and employee coverage the returns were typical; their arrangement on either basis would line up the states from which they came in about the U.S. Census order of industrial importance. The total number of replies was 2,064; the total number of employees 1,945,551. The only larger figures were those of the 1937 Census of Manufacturers which had 80 times as many plants, and five times as many employees; 98% of the plants, however, were in the class of 500 or fewer workers, while the N.A.M. replies were only 63% from plants of that smaller size. The report as to the full text, with several of the accompanying tables, is published here (pages 388-397.) This presentation grows on rereading. Editorial comment would remark that it was capably undertaken and wisely analyzed. The conclusions it draws are eminently sound, and the whole picture it portrays is pre-eminently heartening.

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The Twenty-Seventh (1942) Annual Meeting of the American Association of Industrial Physicians and Surgeons and the Third (1942) Annual Meeting of the American Industrial Hygiene Association will be held at Cincinnati, Ohio, April 13-17, 1942.

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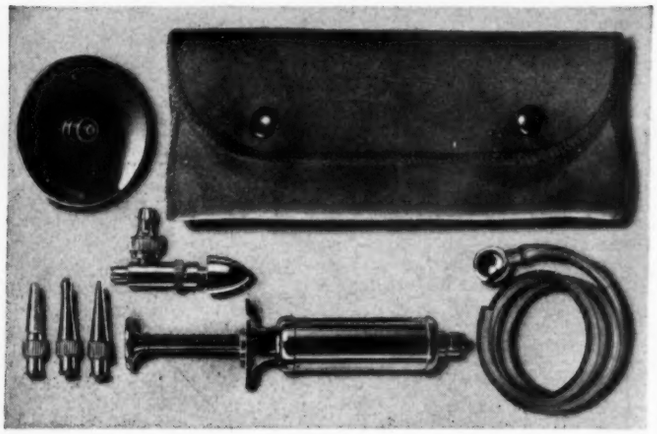

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But at the present time business men won't admit the truth of that assumption. Often I have seen a business man discuss personnel plans to make his employees happier, literally with his eyes sparkling, and then suddenly catch himself, remember that he is a business man with a role to act, and say: "Well, of course, I am interested in this *only* because it will increase profits."

This is hypocrisy and, like all hypocrisy, it stands in the way of sound planning and action. — From an article by TEMPLE BURLING, M.D., in *Mental Hygiene*, April, 1941.

Priority

E. R. STETTINIUS, JR., Office of Production Management priorities director, today announced a "health supplies rating plan" under which priority ratings of A-10 will be given to provide scarce materials necessary for medical, surgical, and dental essentials necessary for public health.—*Chicago Tribune*, August 26, 1941.

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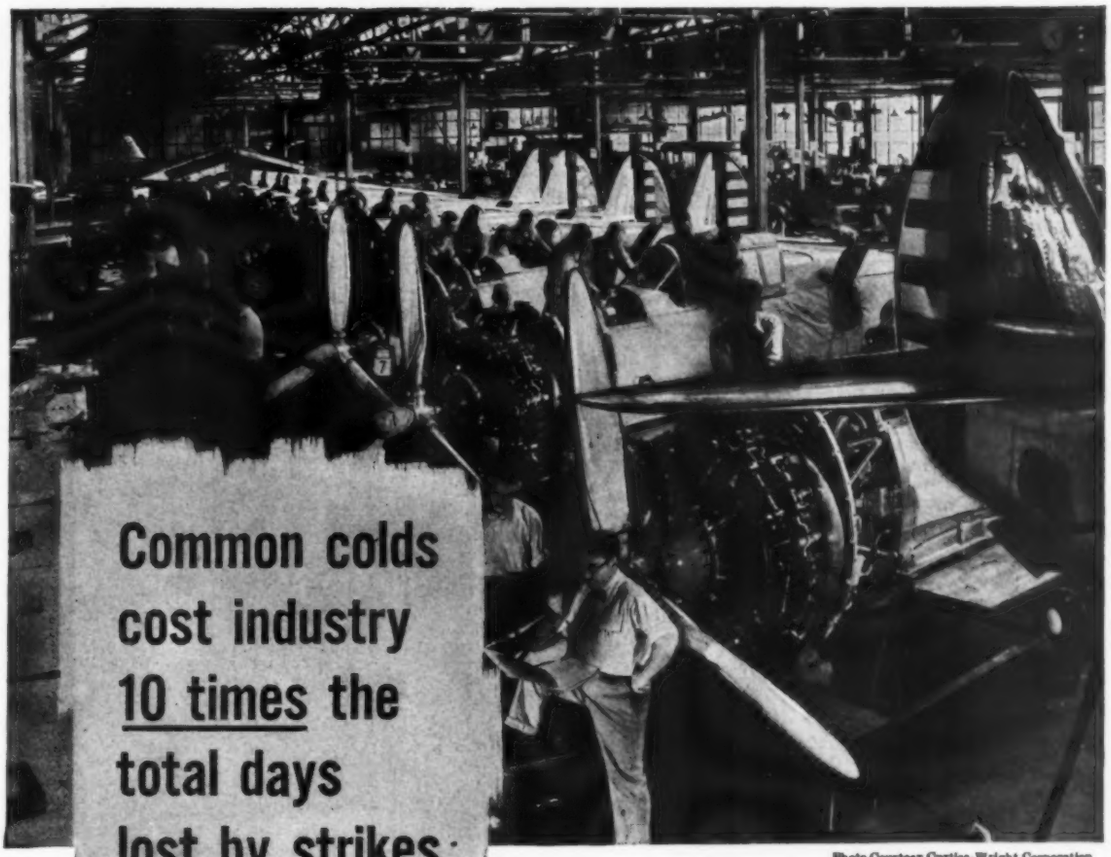

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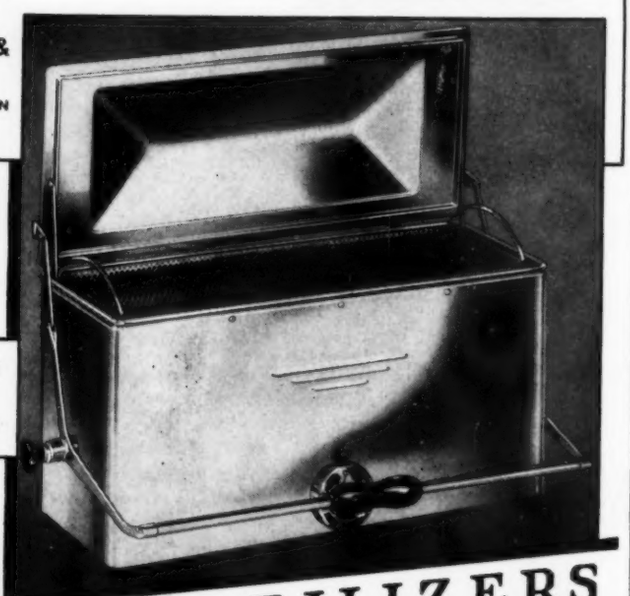

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PELTON STERILIZERS

—*Continued from page 6.*

Item

ORDINARY fruit pectin, the substance that helps a housewife make jelly, has been discovered to be a valuable substitute for blood in transfusions at the Henry Ford hospital here. Four doctors on the hospital's medical staff today announced results of their experiments with pectin. They called it by its technical name — monoarabinomonogalactodiacetylheptamethoxyloctagalactoionic. Pectin has arrived in its new use, it was said, at a moment in history when it can save the lives of innumerable soldiers. The British government has made inquiries on its use already, it was said. It is obtained easily and cheaply from fruit. —*Chicago Tribune*, August 13, 1941.

Enthusiasm

TO many who have attempted to analyze the current Washington panorama in terms of that order and method which ought to govern the spending of other people's money, the political insincerities and expediencies which seem the daily routine suggest an appeal either to psychiatry or a sense of humor. Keeping

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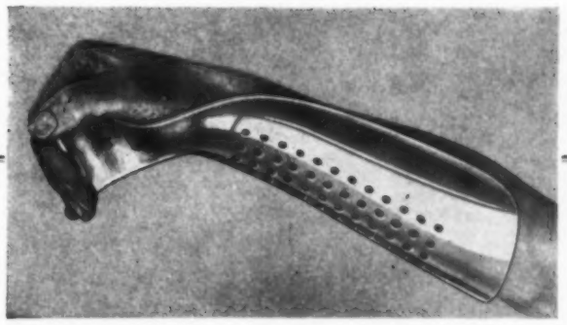

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Toxic

IRVIN BARNES, arrested for drunkenness because of his staggering gait and vomiting on the street, was found suffering from benzine poisoning. Irvin works in a straw-hat factory.—From "A Doctor's Diary," by MAURICE CHIDECKEL, M.D., *Roche Review*, August, 1941.

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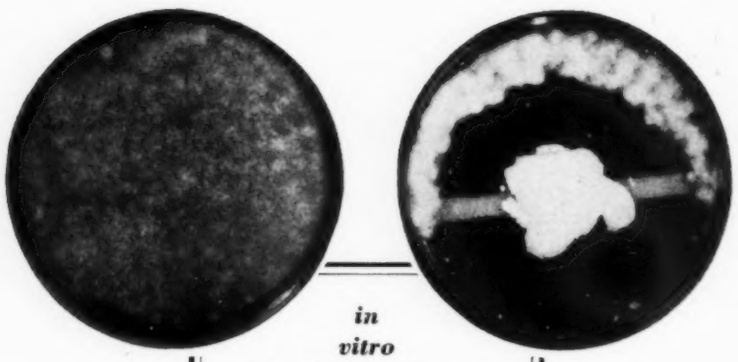

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of those to whom the Workmen's Compensation Act applies. The program foresees establishment in each county of a panel of physicians, familiar with compensation cases. Doctors working for insurance companies would be specifically excluded from the panels. The state medical association has been asked to cooperate, and union locals throughout the state will recommend physicians with records of satisfactory work in cases where compensation is involved. Said a Federation official: "Our purpose is to try to end the 'contract doctor' set-up, under which a doctor agrees to stand the entire cost of medical care for a percentage of the insurance company's premium. The less care an injured worker is given, the more money remains for the doctor. The result has been tragic for injured workers."—From *Medical Economics*, August, 1941.

Navy Medical Department

THE Bureau of Medicine and Surgery of the U. S. Navy has established a section of industrial health to help increase production in the Navy's industrial shore establishments by keeping preventable accidents and industrial disease at a minimum. Sixteen medical officers recently completed courses of postgraduate instruction at the schools

—*Continued on page 12.*

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—*Continued from page 10.*

of public health of Columbia University in New York and Harvard University in Boston. These officers were to be assigned to the shore establishments. The Naval Medical School is also training and equipping mobile epidemiologic and sanitary units, which may be sent to meet health emergencies wherever the Navy's forces are distributed. The central laboratory in the Naval Medical School will serve as a base for these units to carry out investigations too complicated to be done in the field. It is pointed out that the purpose of this plan is twofold: first, the eradication and prevention of spread of infectious diseases and, second, the accumulation of knowledge which should be of value in the future.—*J.A.M.A.*, August 16, 1941.

PULMONARY Diseases in the Mining Industry" is the title of Bureau of Mines Information Circular No. 7146. This is a comprehensive study of bronchitis, influenza and pneumonia, tuberculosis, authrocosilicosis and silicosis, from all available data, prevention, allowable concentration of dust in mining, and methods of control. This trea-

—*Continued on page 14.*

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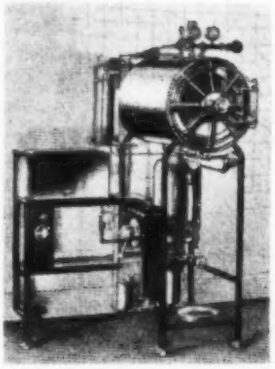

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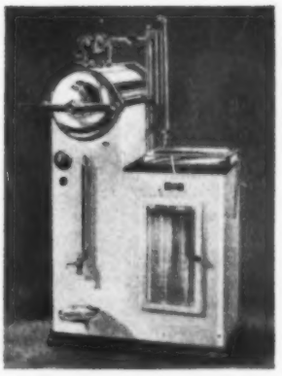

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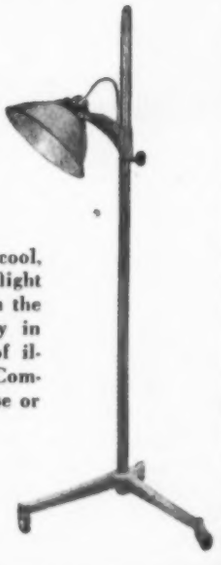

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—*Continued from page 12.*

tise is by DR. ROYD R. SAYERS, Director of the Bureau, and Senior Surgeon, U. S. Public Health Service.

AN interesting book note is the current one on Wilmer C. Wright's translation of Ramazzini's "Diseases of Workers." This volume is published by University of Chicago Press. It is described as "the Latin text of 1713, revised, 549 pages, cloth $5.00" DR. VACCARO'S review (in August), however, was *not* inspired by that translation. He writes that his comments here are the result of *his own* translation of the original Latin text.

Meetings

THE AMERICAN CONFERENCE ON INDUSTRIAL HEALTH will hold its Second Annual Meeting at Chicago, November 5 and 6, 1941. The tentative program was published in the August issue of INDUSTRIAL MEDICINE; the completed program will appear in the October issue.

—*Continued on page 16.*

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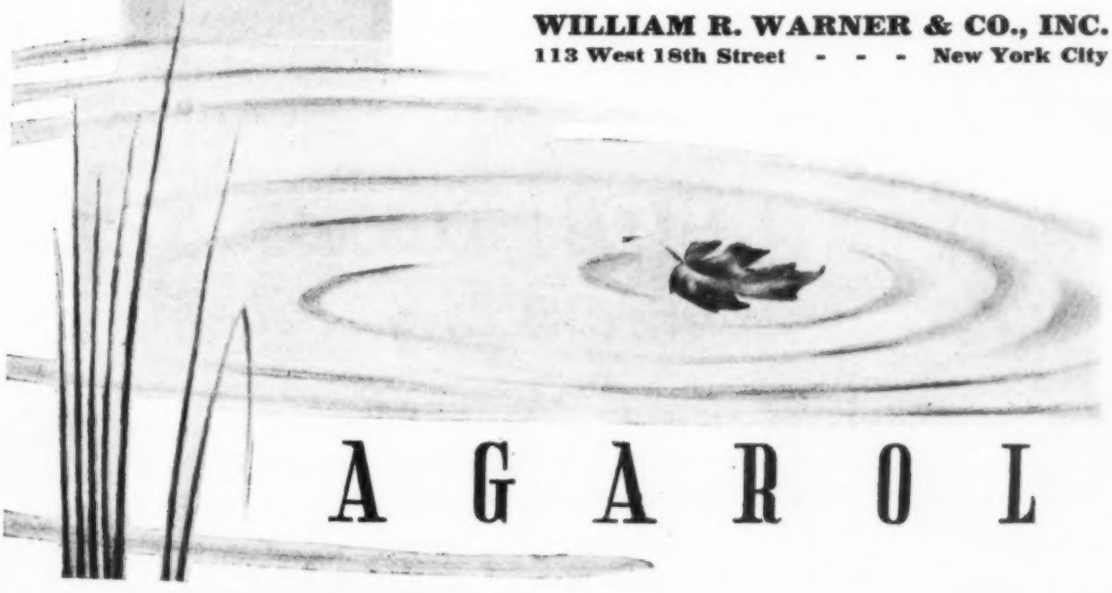

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—*Continued from page 14.*

New York State Society

THE 1941 annual meeting of the NEW YORK STATE SOCIETY OF INDUSTRIAL MEDICINE will be held at Rochester, New York, on October 23.

Alabama Association

THE ALABAMA ASSOCIATION OF RAILROAD AND INDUSTRIAL SURGEONS will hold its Annual Meeting on September 30.

Georgia Association

THE GEORGIA ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS will meet this year at Sea Island, Georgia, on September 27.

Industrial Hygiene

HARVARD SCHOOL OF PUBLIC HEALTH, Department of Industrial Hygiene, is planning to give another short course in industrial hygiene similar to the one recently finished for Naval medical officers. This will start with the opening of the school year, September 22, and will close shortly before Christmas. Properly qualified engineers, as well as doctors, are eligible for the course. Tuition will be the same as before, $200. For further information write to PHILIP DRINKER, 55 Shattuck Street, Boston.

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This magazine is published to promote sound thought upon and concerning industrial medicine and traumatic surgery. To that end it will contain articles, news items, reports, digests, and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited.

Industrial Medicine

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The Journal of Occupational Diseases and Traumatic Surgery

With which are consolidated "The Industrial Doctor" and "International Journal of Medicine and Surgery."

The Science, the Law and the Economics of Industrial Health

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Silicosis, and Silicosis with Tuberculosis

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IN AN article on silicosis and silicosis associated with tuberculosis, which was published in 1938,[1] we analyzed 66 cases which came under our observation at Sea View Hospital. We also presented three cases which we considered atypical in that the clinical symptoms and roentgen findings strongly suggested the coexistence of silicosis and tuberculosis, but in which postmortem examination revealed pulmonary tuberculosis with no evidence of silicosis. Since that time, 16 additional cases of silicosis and silicosis with tuberculosis have come to our attention. To these we wish to add two atypical cases.

The importance of the occupational history is a factor which has been insufficiently stressed in many discussions and presentations on silicosis. We again wish to emphasize this point because of an incident which occurred in our experience where a diagnosis of silicosis was made in an individual engaged in an occupation where there was no free silica present in the air although the atmosphere was an extremely dusty one. The prime purpose of this paper is to attempt to avoid making such errors in the diagnosis of silicosis.

Changes in the lungs may be found on roentgenographic examination following the inhalation of excessive quantities of any number of mineral dusts, but the properties of free silica alone are responsible for the typical characteristic fibrosis of silicosis.

A question has been raised as to whether it is possible for silicosis to develop in individuals working with cement. In January, 1935,[2] the Portland Cement Association requested the Saranac Lake Laboratories to survey a representative group of its member plants. Investigations were carried on at 17 plants in order to determine the nature of the dusts in the atmosphere and also to ascertain whether these dusts produced significant changes in the lungs of the men engaged in making cement. Chemical studies on Portland cement gave the following average results:

COMPONENT ANALYSIS (RAW MATERIALS) INGREDIENTS—UNCOMBINED		
Silicon dioxide	(SiO_2)	19.86%
Lime	(CaO)	65.08%
Iron oxide	(Fe_2O_3)	3.63%
Aluminum oxide	(Al_2O_3)	7.37%
Magnesium oxide	(MgO)	1.06%
Sulphuric anhydride	(So_3)	1.78%
Ignition loss		0.73%

In the manufacture of cement, the basic uncombined ingredients combine with each other and the finished product, cement, has the following composition:

CALCULATED COMPOUNDS (FINISHED PRODUCT) INGREDIENTS COMBINED		
Tricalcium silicate	($3CaO.SiO_2$)	50.4%
Dicalcium silicate	($2CaO.SiO_2$)	19.0%
Tricalcium aluminate	($3CaO.Al_2O_3$)	13.4%
Tetracalcium aluminoferrite	($4CaO.Al_2O_3.Fe_2O_3$)	11.0%
Calcium sulphate	($CaO.SO_3$)	3.0%
Free lime	(Ca O)	0.9%
Magnesia	(Mg O)	11.0%
Free silica	(SiO_2)	0.01%
Ignition loss		0.7%

From the foregoing it is observed that 20% of free silica is used in the manufacture of Portland cement, but the analysis of the completed product contains practically no uncombined silicon dioxide. An atmosphere which contains no free silicon dioxide, no matter how dusty, no matter how small the size of the dust particles, no matter how great

Material for this article was obtained and studied at Sea View Hospital during 1938 and 1939.

the concentration of these dust particles, irrespective of the length of exposure to this dusty atmosphere, cannot cause silicosis. Dust containing silicon dioxide in a combined state cannot be an etiological factor in the causation of silicosis. It can, therefore, definitely be stated that cement offers no silicosis hazard.

A COMPREHENSIVE and detailed occupational history should include all occupations in chronological order, starting with the time at which the individual began to work. In securing this information the following factors should be included:

1. *The type of work done:*

Rock drilling, stone cutting, sand blasting, metal polishing, etc.

2. *The environment in which work was carried on:*

(a) The number of dust particles per cubic foot of air. Significant pulmonary fibrosis has not been found in persons exposed to less than 5,000,000 particles of dust per cubic foot of air. Silicosis has been produced in experimental animals by exposing them to concentrations of 200 million dust particles per cubic foot of air over a period of 12 months.

(b) The size of the dust particles. Only particles less than 10 micra in diameter are effective in the production of silicosis. The particles taken up by the reticulo-endothelial cells in the pulmonary alveoli are usually less than 5 micra in diameter.

(c) The mineral content of the rock. Quartz which contains 100% of free silica constitutes the most serious of silicosis hazards. Granite contains between 50% and 60% of free silica and is also a serious silicosis hazard.

3. *The duration of exposure:*

It was formerly believed that exposure of at least 10 years was necessary for the production of silicosis. It is current opinion that with exposure to sufficient concentration of dusts containing a high percentage of free silica, the disease may develop in a considerably shorter period. No hard and fixed rule can be applied to determine whether or not silicosis will develop in a given instance, but the formula advocated by Ornstein[3] might be used in considering the possibility of the presence of silicosis. Silicosis develops on exposure to silicious dusts containing 20% free silica, with particles under five micra in diameter, and exceeding a concentration of 20,000,000 particles per cubic foot of air, and with a continuous exposure of no less than five years. Should the silica content increase, the particles become finer, the concentration of the particles greater, the duration time required for the production of silicosis becomes proportionately shorter. Recently, several authors have described an acute form of silicosis. Thomas and Cummins,[4] in 1937 reported five cases of silicosis in lead miners, who worked as a gang in drilling a tunnel through sandstone (quartzite) using dry compressed air drills. The average duration of exposure was 31 months. The men became ill with increasingly severe pulmonary symptoms within a short time of each other. The average duration of the illness was 19 months and death ensued in an average of 18 months following the cessation of work.

Autopsy of the lungs showed an extensive nodular silicosis. All showed interstitial pneumonia and two had tuberculosis. Sweany,[5] reported a case of silicosis in an individual who had been exposed for four months to rock particles of almost pure quartz. In a previous contribution,[1] we reported a case of silicosis following exposure of only three months.

4. *The type of tools used:*

(a) Compressed air drill—wet or dry.
(b) Jackhammer. (c) Dynamite.

5. *Protective devices used:*

(a) Masks or hoods. (b) Respirators.
(c) Exhaust fans. (d) Water.

These factors are of such great importance that it is only after a detailed consideration of all of them that an occupational history can be called complete.

THERE were 16 cases of silicosis and silicosis associated with tuberculosis observed by us at Sea View Hospital during a period of 18 months. The ages of these patients ranged from 34 to 66 years, with the average of 48 years. There was a history of exposure to dusts rich in free silicon dioxide in every case. The length of exposure varied from two to 44 years with an average duration of 15 years. The industries represented were the mining of anthracite coal, stonecutting, rock-drilling, metal polishing with the use of an emery wheel, sandblasting, porcelain work, excavating and foundry work. A history of the use of a jackhammer, compressed air drill, dynamite or an emery wheel was obtained in every instance.

The interval from the time that the patient left his dusty occupation until his admission to the hospital was obtained in every case. There were three patients admitted within one year; three from one to five years, one from five to 10 years, seven from 10 to 20 years, and two after 20 years.

Four of the 16 patients had uncomplicated silicosis whereas the remaining 12 had silicosis and pulmonary tuberculosis. Eleven of these 12 patients had tubercle bacilli in the sputum at all times while under our observation, and the twelfth patient had had a positive sputum prior to 1936. All examinations subsequent to that time were negative. There were six deaths in this group, and postmortem studies were made in five: they showed extensive pulmonary tuberculosis with cavitation in addition to widespread silicosis and pulmonary emphysema.

The four patients with uncomplicated silicosis had persistently negative sputa. Numerous examinations of the gastric contents were likewise negative for tubercle bacilli. Two of this group died and a postmortem study was made on one. The latter had worked as a stonecutter for nine years.

He was admitted to the hospital 19 years after the cessation of his work as a stonecutter. His hospital stay was evidenced by gradual decline. Postmortem examination revealed an extensive silicosis of all lobes of both lungs as well as silicosis of the tracheobronchial lymph nodes. There were also metastases to the tracheobronchial nodes and the parietal pericardium from a carcinoma of the stomach.

In addition to the 16 cases just described, two other cases of unusual interest came to our attention.

The first case (Case 17, Figure 5A) was that of a 53 year old white male who gave a history of working as a fruit packer for 19 years and as a seaman for 10 years prior to 1929, when he became ill. At this time, he began to complain of dyspnea which slowly became more severe. Pulmonary tuberculosis was diagnosed in 1935. His sputum was positive for tubercle bacilli on all examinations. During the ensuing months nocturnal dyspnea became manifest, and the patient also began to notice swelling of the ankles and pain in the right upper abdominal quadrant. The patient was admitted to Sea View Hospital in 1939, at which time he was acutely ill. Physical examination revealed a double murmur over the entire precordium, most marked over the pulmonic area and transmitted to the axillae, neck and interscapular regions. There were altered breath sounds of diminished intensity, and numerous bubbling rales throughout both lungs, but most pronounced at the bases. The liver was markedly enlarged, and an ascites was present. There was also marked edema of the lower extremities. Roentgen ray examination of the chest revealed an enlarged cardiac silhouette and a dilated aorta. There was a marked increase in the size of the hilar shadows, particularly on the right side. There was a diffuse nodular lesion disseminated throughout both lungs, most profuse in the mid-lung fields. There was also a dense conglomerate shadow in the left mid-lung zone. This picture was extremely suggestive of silicosis with tuberculosis, but in view of the cardiac history, which revealed several episodes of decompensation, the changes in the lungs were interpreted as being due to congestive changes secondary to heart disease, and a concomitant pulmonary tuberculosis. This impression was strengthened by the absence of an occupational history of exposure to dust.

The second case (Case 18, Figure 5B) a colored man, 32 years of age, gave a history of having worked as a truck driver for 10 years. There was no other occupational history. Physical and roentgen ray examinations revealed bilateral, far advanced pulmonary tuberculosis. The sputum was positive for tubercle bacilli. At postmortem examination, extensive pulmonary tuberculosis with bilateral cavitation was found. In addition, numerous flat-topped grey silicotic nodules were scattered throughout both lungs and there was also a silicosis of the tracheobronchial lymph nodes. The patient's clinical chart was then rechecked, but no further details of his occupational history were available. There was no mention of the patient's original home environment, no mention of the work done previous to his occupation as a truck driver, and there were no references as to what materials he transported. We were confronted with an inadequate occupational history which left us at a loss as to how so young a patient fell heir to the silicosis which was discovered on postmortem examination.

It would be in order at this time briefly to describe a third case (Case 19, Fig. 5C) which illustrates an important point in association with individuals engaged in dusty occupations. This patient was a 55 year old white male, in good health, and an employee at the hospital. He gave a history of having driven coal wagons and trucks for a period of 30 years. A routine roentgen ray examination of the chest revealed a marked exaggeration of the linear markings throughout both lungs together with a marked increase in the size of the hilar shadows. There was no nodulation. Such shadows are produced by the prolonged inhalation of excessive amounts of any dust and are similar to the linear exaggerations described by Gardner[2] and his co-workers in their survey of employees in cement plants. They are without clinical significance.

Case Histories

CASE 1 (Figure 1A): S.F. Male, white, age 63. Worked as a metal polisher, using an emery wheel for 12 years (ages 20-32). For the next 18 years he was a sandblaster in an extremely dusty atmosphere. During the last 10 years of this work he used a gauze mask, which afforded little protection against the sand particles. The following 12 years he worked at odd jobs, including metal polishing. Onset of pulmonary symptoms in 1935. Hospitalized in 1938 as a case of silicosis with tuberculosis. All sputa negative for tubercle bacilli. Discharged after 16 months of hospitalization with diagnosis of silicosis, no evidence of tuberculosis having been found.

CASE 2 (Figure 1B): F.R. Male, white, age 52. Worked as a graphite miner using hammer and chisel, and dynamite for four years. No protective devices. The following four years he worked on a machine press. He was unemployed for the next three years, following which he worked in an office for one year. He then spent two years casting silverware, where he did considerable sandblasting. From then on his employment was not in a dusty atmosphere. Pulmonary symptoms developed 10 years after cessation of eight years of exposure to dusts rich in silica. He was hospitalized with a diagnosis of silicosis with tuberculosis. Sputa were negative for tubercle bacilli. Discharged after one year as a case of silicosis. At no time were there evidences of tuberculosis.

CASE 3 (Figure 1C): O.A. Male, white, age 66. For four years he was a granite cutter using hammer and chisel, and dynamite in an extremely dusty atmosphere. There were no protective devices used. For the next 30 years he did monumental work chiefly with granite, using pneumatic tools and compressed air drills, with no protective devices. The next nine years he worked periodically as a granite cutter. The following two years he used point chisel and pin-hammer in cutting curbstones (bluestone) on highways. Pulmonary symptoms developed during this time, and one year later he was admitted to Sea View with a diagnosis of silicosis and tuberculosis. While at the hospital all sputa were negative, and after eight months he left of his own volition with a diagnosis of silicosis without tuberculosis.

CASE 4 (Figure 1D): A.M. Male, white, age 55. Worked eight hours a day as a stonecutter for two years, using

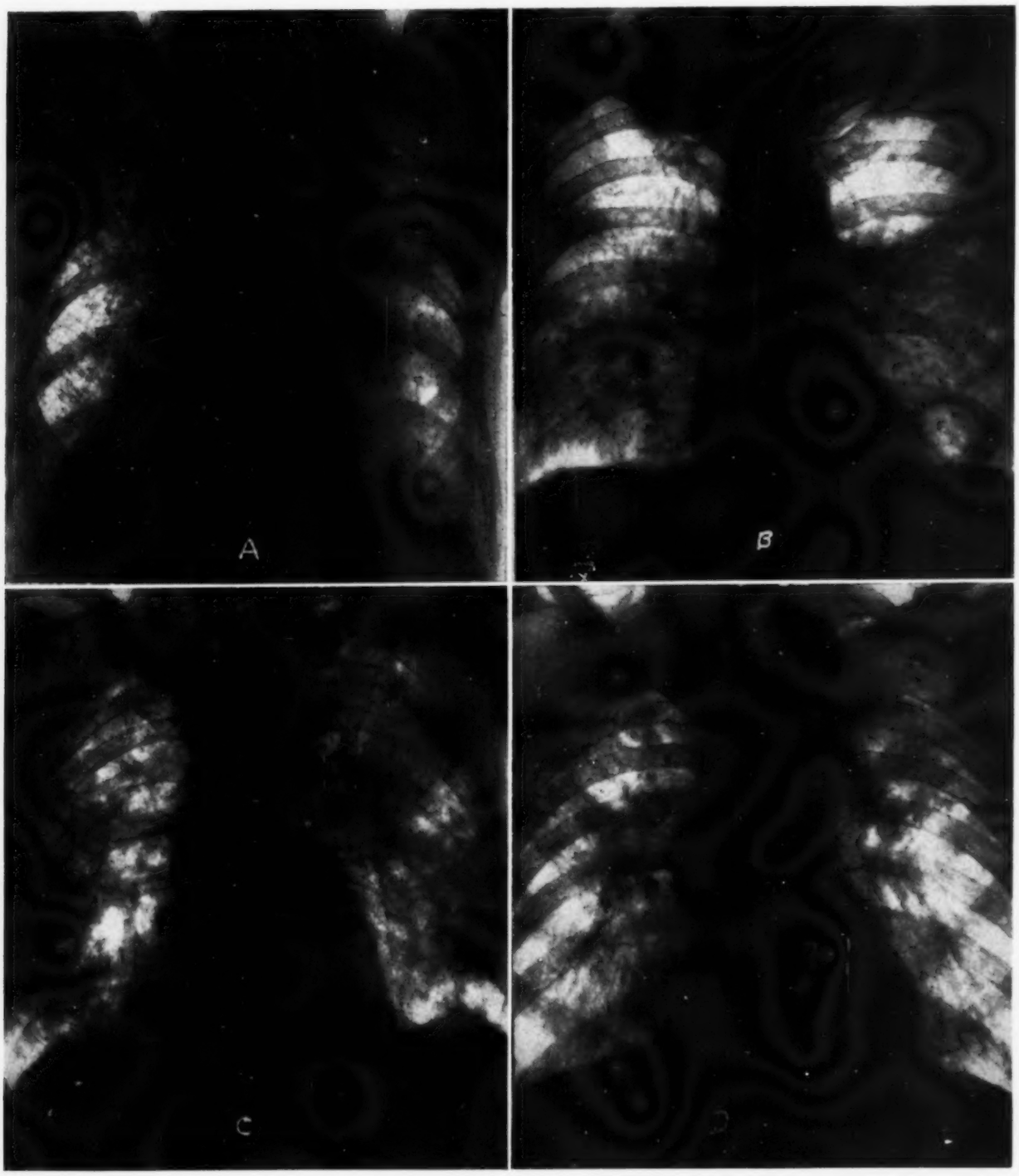

Fig. 1.

hammer and chisel. No protective devices. The next two years patient worked in a tile factory. No exposure to silica. The next 28 years he worked as a smelter and a supervisor in a lead refinery. Pulmonary symptoms developed during the last two years of this work. Admitted to Sea View Hospital with a diagnosis of pulmonary tuberculosis. Course steadily downhill. All sputa negative for tubercle bacilli. Expired six weeks after admission. Postmortem examination revealed silicosis of the lungs and tracheobronchial nodes and extensive pulmonary emphysema. There was no evidence of pulmonary tuberculosis. There was a fungus carcinoma of the stomach with intestinal metastases.

CASE 5 (Figure 2A): J.E. Male, white, age 48. Anthracite coal miner for 17 years. Used jackhammer, compressed air drill and dynamite. The next five years he worked as a house painter with no exposure to silica. Pulmonary symptoms occurred five years after cessation of exposure to silicious dusts. Admitted to hospital with diagnosis of silicosis with tuberculosis. Sputa were positive for tubercle bacilli. Course slowly downhill. Expired in one year following massive hemoptysis. No postmortem obtained.

CASE 6 (Figure 2B): O.H. Male, white, age 48. Worked as a laborer using pick and shovel for three years. The following eight years was a stonecutter on granite tombstones, using compressed air drills. No protective devices were used, and he worked eight hours a day. From that time on he worked as a carpenter with no exposure to silicious dust. Pulmonary symptoms appeared 22 years after cessation of work with exposure to dusts containing silica.

Hospitalized with diagnosis of silicosis with tuberculosis. Signed out after 15 months of hospitalization with five-positive sputa.

CASE 7 (Figure 2C): S.R. Male, white, age 42. History of having been gassed three times during World War. Onset of productive cough one year later. Worked as an anthracite miner two years (1919-1921). Following this, worked as a watchmaker. In 1933 was admitted to Sea View Hospital with productive cough and several small hemoptyses and left chest pain. All sputa were negative. Discharged one year later with diagnosis of bronchiectasis. Readmitted five years later (1939) with dyspnea, cyanosis and emaciation. Sputa positive. Course progressed downhill. Expired six weeks after admission. Postmortem findings: Anthracosilicosis of both lungs, pulmonary emphysema and pulmonary tuberculosis with cavitation. This patient died of silicosis with tuberculosis 17 years after cessation of exposure to silicious dust which extended only over a period of two years.

CASE 8 (Figure 2D): A.V. Male, white, age 53. Worked as a carpenter's apprentice for one year (16-17). For the next two years he worked as a delivery boy (17-19). The following seven years he was a rock driller, using a dry drill and dynamite. No protective devices were used. From then until he became ill, 20 years later, he worked as a newspaper delivery man. Symptoms developed in 1932 when he was 46 years old. His sputum was positive but he continued to work for six years. In 1938 he was forced to stop work because of dyspnea, weight loss and fever. Hospitalized in 1939 with diagnosis of bilateral

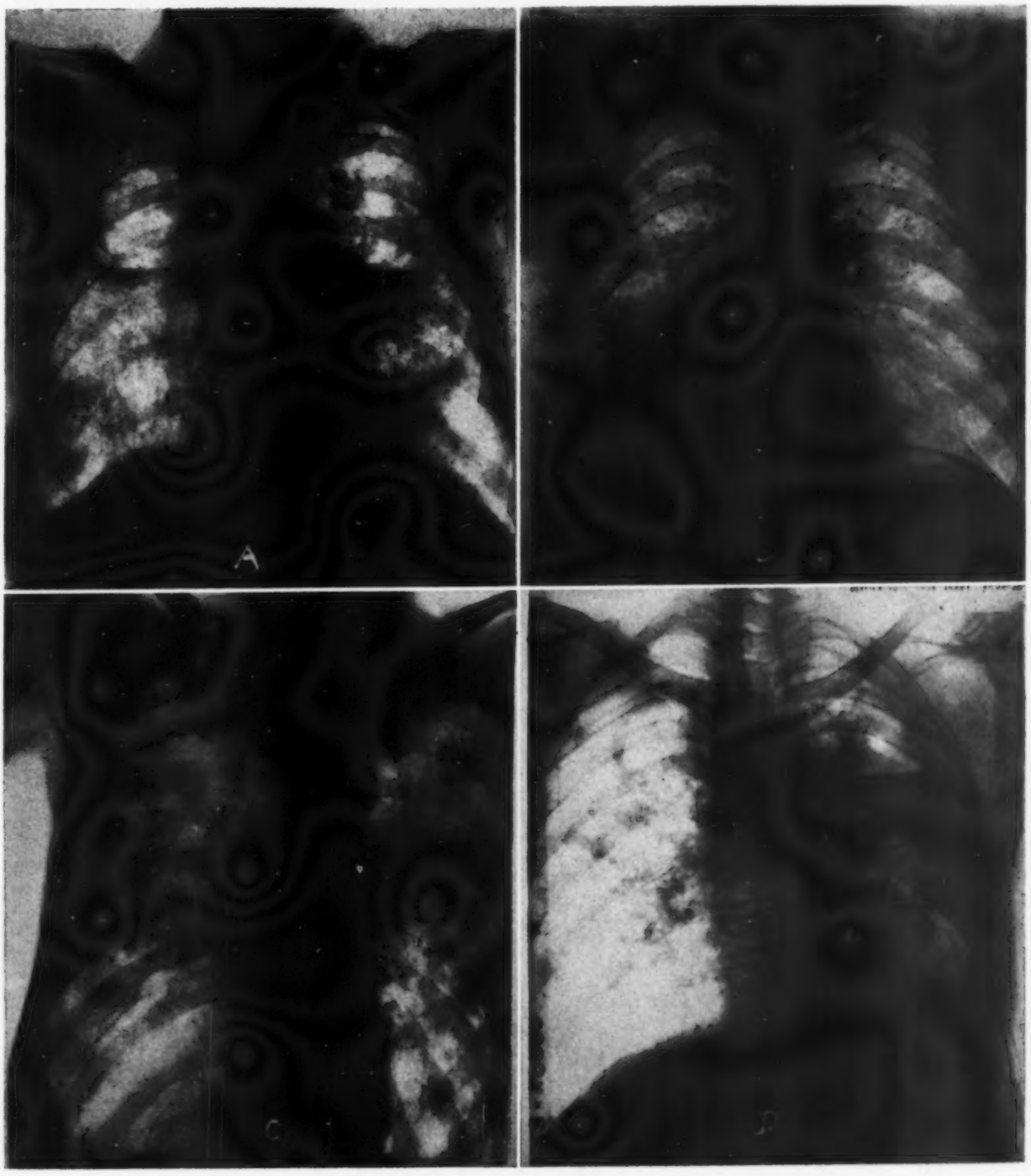

Fig. 2.

caseous pneumonic tuberculosis with silicosis. Sputum was positive. Signed out of his own volition after four months in hospital.

CASE 9 (Figure 3A): E.N. Male, white, age 58. For 10 years this patient worked as a laborer. The following year he worked in an iron factory, sharpening tools with an emery wheel. The next three years he worked on subway construction. The following year he worked as a trackman for a railroad, then for one year grinding wheels for Pullman cars with an emery wheel. The next three years he was in a porcelain factory, using an emery wheel with no protective devices of any type. The next eight years were spent as a moulder in a brass foundry. Symptoms developed at that time, and he was admitted to Sea View Hospital with a diagnosis of extensive bilateral pulmonary tuberculosis, pulmonary emphysema and silicosis. Sputum positive for tubercle bacilli.

CASE 10 (Figure 3B): J.J. Male, white, age 34. Seaman for three years, (15-18). The following two years he worked on alternate days as a rockdriller, using a water drill. No protective devices. The next four years he worked as a dredger. The following two years he was again a seaman. The next six years he was a steward on a ship. The next six months he worked in a drydock repairing ship's boilers. Symptoms appeared at this time, 14 years after cessation of exposure to dust rich in silica. This exposure lasted only two years. Hospitalized with a diagnosis of tuberculosis and sputa positive. Course

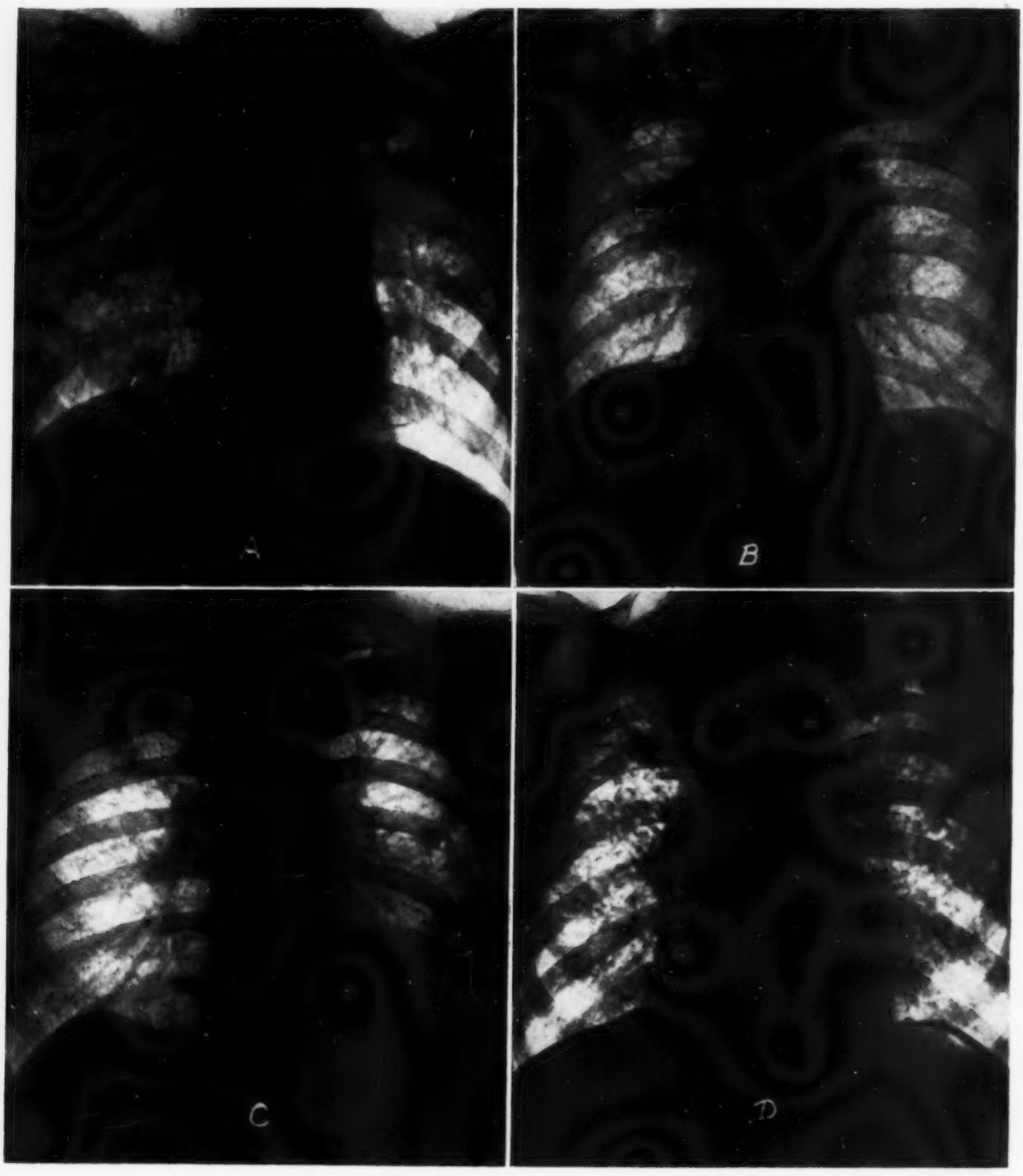

Fig. 3.

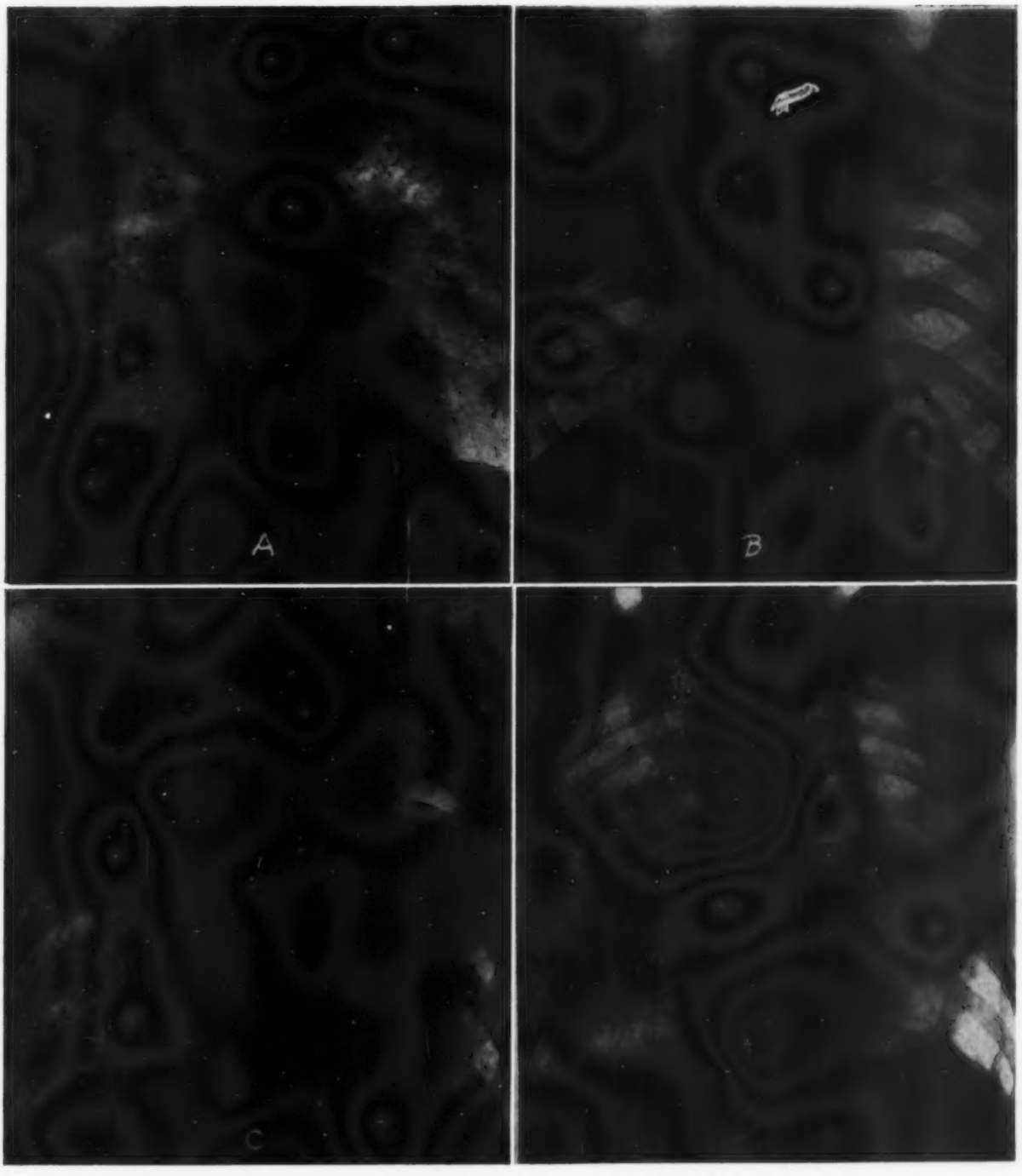

Fig. 4.

gradually downhill, and he expired 18 months after admission. Postmortem revealed silicosis and tuberculosis, pulmonary emphysema and silicosis of the peribronchial lymph nodes.

CASE 11 (Figure 3C): D.D. Male, white, age 43. Worked for five years in anthracite coal mines loading coal, drilling and blasting with dynamite. Used electric and hand drills, both wet and dry, as well as a jackhammer. No protective devices employed. The following five years he worked as a rockdriller. One year later had a bilateral pneumonia with left empyema. Thoracotomy done. Pulmonary symptoms developed one year later, and sputum was positive for tubercle bacilli. Hospitalized at Sea View, and sputa subsequently became negative, and remained so to date.

CASE 12 (Figure 3D): P.M. Male, white, age 48. Worked as a polisher in a copper wire factory for two years, using an emery wheel with no protective devices. The following year he was a rockdriller in a coal mine where he used a compressed air drill. The next three years he worked at odd jobs, with no exposure to silicious dusts. He again worked as a rockdriller for four years, using a compressed air drill. The next six years he was a coal passer and fireman, and finally he worked for four years chipping rust from iron. Pulmonary symptoms appeared 10 years after cessation of exposure for nine years to dust rich in silica. Hospitalized, with diagnosis of bilateral caseous pneumonic tuberculosis. Sputum positive for tubercle bacilli. Course in the hospital was gradually downhill and he expired after 22 months. Postmortem examination disclosed extensive bilateral caseous pneumonic tuberculosis with

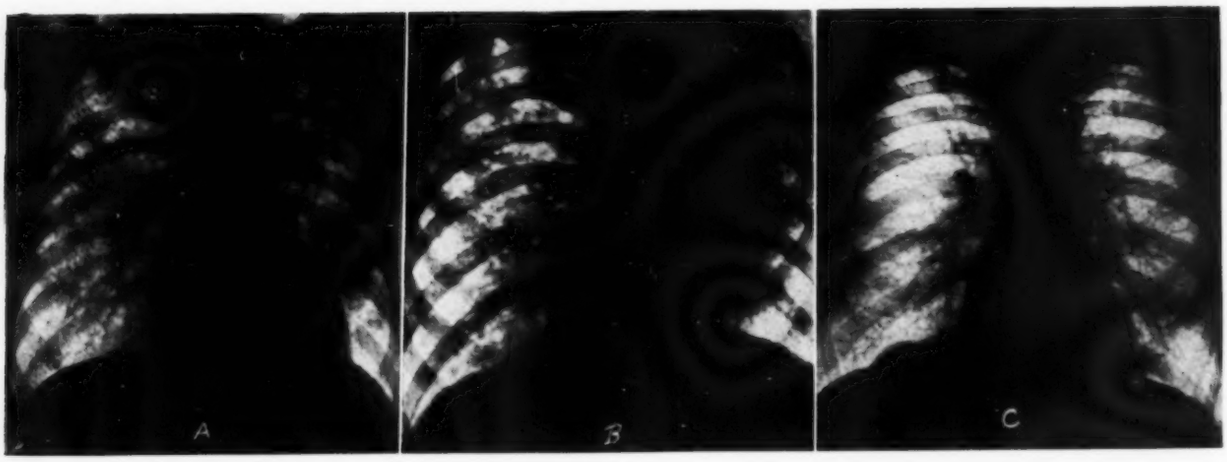

Fig. 5.

cavitation and silicotic nodules diffusely scattered through both lungs.

CASE 13 (Figure 4A): H.S. Male, white, age 47. This patient worked for four years as a sailor and for nine years as a fisherman. The next 11 years he worked as a sandblaster. He wore a gauze mask during the last two years of this work. Pulmonary symptoms appeared at this time and he was hospitalized for a lung abscess. Symptoms subsided following surgical treatment of abscess. Three years later symptoms reappeared. Sputum positive for tubercle bacilli. Admitted to Sea View Hospital with diagnosis of silicosis with tuberculosis. Signed out after six months with no marked change in general condition. Sputum positive.

CASE 14 (Figure 4B): G.B. Male, white, age 42. This man was hospitalized at Sea View Hospital between the ages of 14 and 20. The next 22 years he was a sandblaster, using a compressed air sand spreading machine. No protective devices were used during the first 10 years of this work. The next 10 years he used a canvas hood which offered little protection from dust particles. Later he used a regular respirator. Pulmonary symptoms and elevation of temperature appeared at this time. Sputum positive, and he was hospitalized as a case of silicosis with tuberculosis. Signed out after 14 months in hospital. Sputum positive.

CASE 15 (Figure 4C): C.J.S. Male, white, age 60. Stonecutter (granite monuments and tombstones) for 44 years (16-60). Used compressed air dry drill. A protective device fitting into nostrils was used during the last 10 years of his work. Symptoms appeared at the age of 60, and he was admitted to the hospital with diagnosis of silicosis and tuberculosis with positive sputum. Roentgen examination revealed bilateral far advanced tuberculosis with extensive cavitation on the left side. Course steadily downhill, and death occurred seven months after admission. Postmortem examination disclosed extensive pulmonary tuberculosis with cavitation, emphysema, silicosis of lungs and tracheobronchial nodes, tuberculosis of the larynx, trachea, bronchi and intestinal tract.

CASE 16 (Figure 4D): J.M. Male, white, age 44. Anthracite coal miner for 10 years. He used a jackhammer, dynamite and dry drill, with no protective devices. The following year he worked in a shipyard, reconditioning ships. Returned to the coal fields and did the same work mentioned above for a period of two more years. The next 14 years he worked in hotels as a kitchen man and bus boy. Pulmonary symptoms appeared 14 years following the cessation of exposure of 12 years to dust rich in silica. Developed pneumonia followed by empyema for which thoracotomy was performed. Wound continued to drain. He was then admitted to Sea View with a diagnosis of chronic pulmonary tuberculosis, pulmonary emphysema, and empyema, left. Sputum and empyema fluid positive for tubercle bacilli. Thoracotomy wound showed black particles in drainage and diagnosis of bronchopleural fistula was made. Course in the hospital was slowly downhill, and two years after admission, following repeated massive hemoptyses, the patient expired. Postmortem findings were chronic pulmonary tuberculosis with cavitation, silicosis of lungs, tracheobronchial, and peri pancreatic nodes, emphysema and pulmonary cutaneous fistula, left.

CASE 17 (Figure 5A): V.M. Male, white, age 53. Worked as a fruitpacker in Italy for six years, ages 14 to 20. He then went to sea for 10 years. From then until symptoms appeared he worked as a fruitpacker in California. There was no history of exposure to silicious dust. Admitted to Sea View with a four year history of dyspnea, and nocturnal dyspnea of one year duration, and a diagnosis of chronic pulmonary tuberculosis, emphysema and cor-pulmonale. Sputum positive. Physical examination revealed a double murmur over precardium and of maximum intensity at pulmonic area transmitted to axillae, neck and interscapular region. Course steadily downhill with repeated attacks of cardiac dispensation. Expired nine months after admission. There was no postmortem obtained. The roentgen findings resembled silicosis with tuberculosis.

CASE 18 (Figure 5B): D.L. Male, colored, age 32. Patient was a truck driver for 10 years prior to development of symptoms. There was no history of exposure to harmful dusts. Admitted to Sea View Hospital with pulmonary tuberculosis and positive sputum. He refused collapse therapy. His condition became gradually worse, and death occurred 13 months after admission. Postmortem revealed numerous flat-topped silicotic nodules scattered throughout both lungs and the tracheobronchial nodes in addition to a bilateral pulmonary tuberculosis with cavitation.

CASE 19 (Figure 5C): L.H. Male, white, age 55. This patient is at present an employee at Sea View Hospital. For 30 years previous to his present work he drove coal wagons and coal trucks, with exposure to large amounts of coal dust. He is in good health and his pulmonary findings were discovered in a routine roentgenographic examination. Note the accentuated linear markings and enlarged hilar shadows. These findings may be produced by prolonged inhalation of excessive amounts of any dust.

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Ethylene Dichloride

—Poisoning—

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ETHYLENE DICHLORIDE (CH_2Cl-CH_2Cl) is a chlorinated hydrocarbon used as an insecticide, household cleaning agent, as a solvent for oils, fats, waxes, gums, resins and rubber, and recently as a solvent in cholesterol extraction. It is not to be confused with dichlorethylene from which it differs both pharmacologically and chemically.

Numerous animal studies have been made on ethylene dichloride, but only four cases have been reported of poisoning in human beings from ingestion of or exposure to this chemical. One case of poisoning by ingestion was reported in 1935 and three from acute exposure were reported in 1939. This report covers two cases of poisoning from chronic exposure to ethylene dichloride vapors.

HISTORY: Dutch chemists discovered ethylene dichloride in 1795. It was first used as an anesthetic[1] in 1848-1849. Eulenberg[2] anesthetized rabbits with it in 1876 and found that it caused vertigo, mydriasis, corneal insensibility and conjunctival hyperemia. DuBois and Roux,[3] in 1887, DuBois[4] in 1888, Parnas[5] in 1888, Faravelli[6] in 1892, Bullot[7] in 1896, Erdman[8] in 1912, and Steindorff[9] in 1922, observed that ethylene dichloride when inhaled or injected, caused a temporary blue-white opacity of the cornea in various animals. The opacity was due to lymphocytic infiltration and connective tissue proliferation and clarified after several months. In 1929 Kistler and Luckhardt[10] administered ethylene dichloride by intravenous injection or by stomach tube to dogs. Immediate effects were a drop in blood pressure, excitement, incoordination, and salivation. Later effects were drowsiness, vomiting, dyspnea, tarry stools, and corneal opacities. Dogs that died from the poisoning showed a delay of rigor mortis by several hours, a bloody discharge from the mouth and nostrils, liver hyperemia, subserous hemorrhages of the heart, lung edema, hemorrhages into the mesentery and intestinal lumen, albumin and bile pigments in the urine. In 1930 Sayers, Yant, Waite and Patty[11] exposed guinea pigs to ethylene dichloride vapors and noted irritation of the eye and nose, vertigo, retching movements, ataxia, and finally unconsciousness.

In 1935 Hueper[12] reported a subject who drank two ounces of ethylene dichloride mistaken for gin. The outstanding clinical symptoms were stupor, vomiting, diarrhea, cyanosis and subnormal temperature. Death occurred in 22 hours and was apparently due to circulatory failure. Autopsy revealed an extensive hemorrhagic colitis, nephrosis with marked tubular calcifications and a general passive congestion of the internal organs. Multiple perivascular hemorrhages occurred in the region of the cerebral basal ganglia.

Recently Wirtschafter and Schwartz[13] reported three cases of acute ethylene dichloride poisoning following a four hour exposure to the vapors in a knitting factory. Initial symptoms were dizziness, nausea and vomiting followed by weakness, trembling, and epigastric cramps. Dermatitis of the hands occurred owing to direct contact with the liquid. Liver damage was suspected because of extremely low blood sugar levels. Leucocytosis was present in each case. No hemolysis was noted. Recovery occurred in each case following calcium therapy and a high carbohydrate diet.

The following two cases have been under our observation:

CASE 1: D. S., a white male, aged 24, on March 4, 1941, presented complaints of anorexia, nausea, and vomiting of two days duration the past month, a weight loss of 10 pounds and stated that he felt drowsy while at work. He gave the following occupational history: From 1937 to 1939 he was a U. S. postal employee. From July, 1939, to December, 1940, he worked for a paper and bag company. He was then subsequently employed in a packing plant for nine weeks, 40 hours a week, as a cholesterol operator. His work consisted of grinding spinal cords, 2500 pounds to the charge, using 750 to 900 gallons of ethylene dichloride. He stated he inhaled the vapors of ethylene dichloride during the centrifugal process used in separating the cholesterol and also when he emptied barrels containing the cholesterol.

The family and past histories were irrelevant to the present illness. Physical examination revealed a well developed, nervous, young white man who did not appear acutely ill. The findings of a systemic inventory were negative except for a beginning alopecia. Blood pressure was 110/78 and the temperature normal. The electrocardiographic findings were considered within the limits of the normal electrocardiogram. Laboratory tests showed a negative Wassermann, hemoglobin 88.8% (Newcomer), R. B. C's 5,100,000 W. B. C's 4,600, and the differential count: polymorphonuclears 69%, lymphocytes 29%, eosinophils 1%, and basophils 1%. From the physical examination and laboratory results it was concluded that the patient had recovered from the ill effects of the inhalation of ethylene dichloride vapors, with the exception of the nervousness.

CASE 2: J. M., a white male, aged 28, on June 4, 1941, complained of epigastric pain of four days duration, nausea and vomiting of several days duration and sleeplessness for the past two nights. The occupational history was that of a worker in the cholesterol department of a packing plant for the past five months. Previous to that period he was employed by a railroad company. The family and past histories were irrelevant to the present

complaint. Physical examination revealed a well developed white male who did not appear acutely ill. Significant findings were a marked nystagmus to the left, fine tremor of the tongue, an injected and dry pharynx, chronic bronchitis, and a sluggish patellar reflex. Blood pressure was 118/82 and the temperature normal. Laboratory tests showed a negative Wassermann, hemoglobin 79% (Newcomer), R. B. C's 4,000,000, W. B. C's 6,600, and the differential count of polymorphonuclears 72%, lymphocytes 26%, eosinophils 1%, and basophils 1%. The basal metabolism was minus 3. Fluoroscopic and radiographic examination of the gastro-intestinal tract was negative. The urine had a specific gravity of 1.012, was acid in reaction, and showed no sugar or albumin. The impression was that of symptoms due to exposure to ethylene dichloride which would disappear when the patient was removed from the vapors.

SUMMARY: The only cases of poisoning by ethylene dichloride recorded previous to this report, were those of acute poisoning, either from ingestion or a four hour exposure. The two new cases presented are those of individuals who have been exposed to ethylene dichloride vapors for two and five month periods. Individuals exposed for months to ethylene dichloride vapors showed signs and symptoms of anorexia, nausea, vomiting, epigastric distress, drowsiness, tremors, nervousness, and nystagmus. Death has been reported from the ingestion of two ounces of ethylene dichloride while all cases due to exposure have recovered.

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Pre-Existing Disease

—Aggravation As a Result of Compensable Injury—

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THE benefits of the workmen's compensation act are not limited only to disabling pathological conditions which are solely the result of an injury "arising out of and in the course of employment." The causal relation between injury and disease, which must be established in order to recognize a given case as compensable, does not imply that the pathological condition must have its origin at the time of and as a result of the trauma. Workmen's compensation also covers the employee if disability or death is due to a disease which had its origin prior to the compensable injury, and was *aggravated or accelerated* as the result of a trauma. In this case the entire pathological condition present after the injury is compensable.

There can be no doubt that the workmen's compensation laws intend to protect the worker against all disabilities "arising out of and in the course of employment" irrespective of his physical condition. A weak and sick worker is just as well protected as a strong and healthy employee. He is entitled to the benefits of workmen's compensation in the case of a compensable injury even if the same injury suffered by a stronger and healthier individual would have caused less damage or no damage at all. This is of special importance in cases where "overexertion" is held responsible for the ensuing disability. Overexertion must not necessarily be caused by an act which exceeded in quantity or quality the usual or normal effort required by the routine work. One must admit the existence of a "relative overexertion." An effort or a function which would not impress the average worker as being excessive may be too much and lead to exhaustion if carried out by a weaker individual, or one with a latent disease.

From the point of view of the employer and the insurance carrier it would not be fair to recognize the aggravation of pre-existing disease as a compensable injury, if the employment has furnished only "the last straw necessary to mature a latent diseased condition into actual disability or death." If the pathological condition has progressed to such a degree that disability or death would be expected in the near future regardless of an injury, an incident during insured employment must not be considered the actual cause, especially if it contributed only the "last straw."

When discussing the causal relation between injury and disease one must keep in mind that an adult worker spends approximately one-third of his 24 hour day at work. It is, therefore, obvious that in a large percentage of cases an *intrinsic* disease, which is not due to trauma, will make its appearance during the working period—in other words, during insured employment. Moreover, it is likely that a disease which is about to manifest

itself will appear while the individual is active and at work rather than during a period of rest.

A causal relation between insured employment and an incident which could be responsible for an aggravation of pre-existing disease is established only if the employee's occupation has contributed significantly in exposing him to the injury, or if his activities as employee were obviously responsible for the result of the accident. A purely incidental, local and timely coincidence between the employment and the event, which leads to aggravation of pre-existing disease, does not establish the causal relation. On the other hand it is not required that the accident have its causal origin in the special circumstances of the employee's occupation. It is not necessary for instance that the working conditions entail special risk to the employee. Nor is it significant that the injured worker could have sustained a similar injury outside the course of his employment. The causal relation between insured employment and injury must be recognized if it is not *probable* that the same injury would have occurred at the same time outside employment.

If aggravation of pre-existing disease is claimed as "arising out of and in the course of insured employment" without clear evidence of a significant trauma, rigid examination of all circumstances concerning the accident is required to establish the causal relation. This examination must be supplemented by expert analysis of the entire course of events from a purely scientific medical point of view. Likewise careful attention to these details is essential in cases where compensation is claimed for a disease which in the majority of cases, according to medical experience, is not primarily caused by trauma. Some diseases originating from *intrinsic* causes, are osteomyelitis, osteo-arthritis, tuberculosis of bone and joints, varicose ulcers, and organic disorders of the central nervous system. Finally, we must consider with this group lesions which commonly occur unnoticed in everyday life, for instance infections of minimal injuries of the skin.

A causal relation between trauma and aggravation must be recognized if the aggravation occurs suddenly, i.e., if the expected natural course of the pre-existing disease has taken a sudden turn for the worse. The sooner the aggravation follows the injury the more plausible is the relation. A causal relation is not probable if according to medical experience the expected progress of the pre-existing disease would lead to the same sequence of symptoms without injury.

A special problem in regard to the causal relation presents itself if *two separate injuries* concern the same part of the body. One must discriminate sharply between the result of the two injuries, unless there is a causal relation between the first and the second injury. In the latter case the worker may be entitled to compensation in spite of the fact that the second injury did not arise during the course of employment. Such a causal relation is established if the second injury was substantially due to the result of the first compensable injury.

For instance, an employee receives compensation for a trauma to the head and as a result of this compensable injury suffers from attacks of dizziness or from epileptic fits. During one of these attacks while at home he falls and sustains a Colles' fracture. Although this fracture is not due to an injury while at work, the employee is entitled to the benefits of workmen's compensation because the fracture is the indirect result of the first compensable injury.

Likewise, a person who is unemployed or on a vacation sustains a bruise of the lower leg while playing football. As a result of this injury, which per se is not covered by workmen's compensation, a latent quiescent, pyogenic infection of the tibia is activated, leading to complete disability through a serious attack of osteomyelitis. If the latent infection of the tibia is the result of a compensable injury perhaps many years ago, the flare-up of this infection must be considered the result of the original injury, and the patient is entitled to all the benefits of the workmen's compensation laws.

AGGRAVATION of pre-existing disease through an injury justifies compensation only for the period of time during which the aggravation is actually and entirely caused by the injury. One must attempt to discriminate between the result of the compensable accident and the natural development of the pre-existing disease. This frequently constitutes a difficult task in cases where the disease has been aggravated through a compensable injury only for a *limited period of time*. If the influence of the injury on the pre-existing disease has been eliminated, that is, if treatment has resulted in restoration to the condition present at the time of the injury, compensation is no longer justified. The problem becomes still more involved if the pre-existing disease in itself is a progressive one. There may come a time when the pre-existing disease has reached the stage which it would have reached—according to medical experience — at this particular time without the influence of an injury. The disability, however, is now greater than at the time of the accident. Theoretically there would be no justification for further compensation because the role of the compensable injury as significant contributing factor has ceased. Practically, however, in most of these cases compensation is awarded for the entire disability, if the worker is more disabled than prior to the injury.

The discussion of another pertinent example of aggravation of pre-existing disease through injury may serve to clarify further this complicated issue.

Aggravation of tuberculosis of bone and joints through trauma is possible, especially in cases where a focus of infection near the joint breaks through into the joint. One must consider whether the injury has caused a substantial change or acceleration of an otherwise typical course of the disease, e.g., collapse of a vertebral body. Unfortunately, it often requires a long time before the correct diagnosis is made.

Aggravation of pre-existing tuberculosis of bone and joints can be considered compensable only if the following requirements are fulfilled:

1. The accident must be proved.
2. The injury must be substantial (considerable degree of violence).
3. The disease must be localized in the region of the injury.
4. The development of the tuberculosis must show the characteristic influence of the trauma. The injury must have caused an acceleration and sudden change of this otherwise slowly progressing chronic disease.

We could further amplify the discussion by citing a large number of case histories in which the problem of aggravation of pre-existing disease through injury plays a decisive role, for instance in syringomyelia, sciatica, cancer, osteo-arthritis, rheumatoid arthritis, varicose veins and varicose ulcers.

Summary

THE EVIDENCE OF AN INJURY "arising out of and in the course of employment" is of greatest importance in establishing the causal relation between aggravation of pre-existing disease and insured employment. In addition to a significant trauma the course of events following this trauma must show a definite influence of the injury on the pre-existing disease. Everything must be done to establish the correct diagnosis. The physician cannot seriously approach the problem of causal relation in these cases unless he has an intimate knowledge of the pre-existing disease and sufficient personal experience to distinguish between its expected course and an unusual development. If these requirements are fulfilled as far as is humanly possible, the physician will be in a position to contribute his share toward just and efficient administration of the workmen's compensation laws.

Respiratory Infections

—Their Control in Industry—

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TWENTY-FIVE years ago, when industrial medicine was in its infancy, illnesses and accidents arising out of conditions of work constituted the greatest problem to the doctor in industry. Today the situation that confronts medical authorities and industrialists is far different. Because industry, during this quarter of a century, has responded to the suggestions of safety engineers, installing devices to protect workers against fire, explosion, and other violence, such disasters account now for only 5% of the total time lost by American workers. This is a notable achievement. But another task remains. The challenge which must be answered by industry and medicine today is one that affects not merely a relatively small segment of the nation but the health of the population as a whole. The doctor who is charged by the industrialist to cut down absences of employees must find, primarily, ways to control man's most frequent complaint — the common cold, and other respiratory disturbances.

According to DR. CLARENCE D. SELBY, of General Motors, recently appointed Chairman of the Industrial Medicine Sub-committee of the National Defense Council, "Non-occupational causes, or ordinary sicknesses and injuries outside of employment, such as might occur in any adult group, *account for 95% of time lost in industry and the occupational sources amount to 5%*". . . . The problem of removing the sources of ill health in industry is predominantly in the hands of the general medical profession."

The illnesses, therefore, that chiefly concern the industrial physician are not special and spectacular. They are familiar, and measures taken to prevent their arising will affect the entire community. Obviously the high incidence of respiratory diseases in the United States will be substantially reduced if colds and other respiratory infections are controlled among the American working population. Furthermore preventive measures necessarily must extend beyond the factory gates to the home, where adjustment of personal habits involving eating, sleeping, exercise and relaxation must be made. Such changes in personal customs are certain to have an effect on the worker's wife (or husband), his children or his relatives. Other reforms will be directed at the community itself, and especially at public eating places, where faulty dishwashing methods may be partially responsible for the spread of respiratory infections.

The "ordinary sicknesses" mentioned by DR. SELBY which constitute the major threat to industrial production today are comparatively short in duration. Surveys show they last less than eight days, the majority continuing only from one to three days. The absences are due, as indicated, first of all to respiratory diseases. Repeated investigations show that such diseases are, by all odds, the most frequent causes of work stoppage at the present time. From a poll taken by the American Institute of Public Opinion, Dr. George Gallup, director of the Institute, concluded that the number of days lost each year in industry because of colds and influenza total 59,000,000. To determine how much "economic wastage" was due to colds and "flu" alone, the question was asked, "Did you lose any time from work this winter because of colds or 'flu'?" One person in four answered, "I did lose time." This figure tallies with the estimates of public health authorities, who have adjudged that most persons lose from one to 10 days every year because of colds. A survey by SURGEON PAUL A. NEAL and SANITARY ENGINEER J. J. BLOOMFIELD, Division of Industrial Hygiene, U. S. Public Health Service, which covered 15 states and involved nearly one and one-half million workers, disclosed that respiratory infections caused 44% of the male disabilities and 47% of the female disabilities. The cost of colds to indus-

try has been elsewhere estimated at $1,000,000,000 a year. The other group of complaints which results in a significant number of absences centers around gastro-intestinal disturbances such as are ordinarily encountered by physicians in private practice.

Though it is possible that, out of intensified efforts to control colds and influenza in industry, an effective therapy will be developed, the most immediate contribution medical authorities can make will be in the direction of prevention. A glance at the ways in which these diseases are spread indicates the character of the attack which must be undertaken. According to Col. James G. Cumming, now Chief of the Bureau of Preventable Diseases in Washington, D. C., whose studies regarding the effect of dishwashing techniques on the incidence of influenza during the last World War led to widespread reforms of dishwashing methods, "It is well recognized that infective organisms of the respiratory or saliva-borne infections are transferred in nasal or mouth excretions by the air-borne route or by indirect contact through food, hand-to-mouth or eating utensil transmission." Cumming lists saliva-borne infections as "pneumonia, tuberculosis, influenza, scarlet fever, measles, and other respiratory diseases," and points out that these infections are responsible "directly or indirectly for from 25 to 45% of our mortality." He concludes, succinctly, "The avenues of their distribution must be blocked," and offers this pertinent analogy, "It is obvious that, if an organism is in the mouth it can be transferred on a utensil that is mouthed just as one transfers a culture from one test-tube to another by a platinum loop. The eating utensil may serve as the platinum loop."

In the industrial plant itself the barriers a physician may help to set up to block the spread of respiratory diseases will include the absolute abolition of the common drinking glass and the substitution of single-service paper cups. A bill recently introduced in the California legislature is interesting in this connection. It would require that "every employer who furnishes drinking water to his employees shall provide individual drinking cups wherever approved drinking fountains are not supplied." New York State has approved such a law.

Since bacteria of the coliform group and those causing respiratory infections have been found frequently in wash or rinse waters or on glasses, dishes, and eating utensils in public eating places the physician's preventive program will include a careful study of dishwashing techniques used not only in the company cafeteria or restaurant but also in bars, lunchrooms, soda fountains and restaurants adjoining the factory or even in the community itself. His efforts in this direction assume public health significance, for the protection of workers involves the protection of the townspeople as well. The local health officer usually can be counted on to cooperate in such a program, and frequently the interest of women's "clubs," the local Chamber of Commerce and other civic groups may be enlisted. Bacteriologic examinations of glasses and utensils in local eating places are almost certain to provide the health officer—if he hasn't this information already at hand—with sufficient evidence of disgusting and unsanitary practices in such institutions to arouse public action. There is no dearth of such material on file now. It can be drawn from countless reports of health officers throughout the nation who repeatedly find contaminated tableware and washwaters in places freely patronized by persons from all walks of life. An investigation of the eating places in Plainfield, New Jersey, made by Andrew J. Krog, health officer of that city, offers one illustration. In the majority of the restaurants and soda fountains, Krog found, dishes and utensils were washed in soapy, lukewarm water and then given a cold rinse after each use. In bars, the glasses were doused in cold water and polished with a towel of dubious cleanliness after each use. The glasses were washed with soap and water *two or three times a week.* Bacterial analysis of the rinse water in these bars yielded counts like these: 11,000,000 bacteria per cc., 6,000,000 bacteria per cc., and so forth. In Montgomery, Alabama, an examination of glasses taken from restaurants in the town, with the indentification of bacteria found on these glasses, disclosed that 40% of the bacteria were pathogenic. It is difficult to estimate the extent of the effect that this constant exposure to disease organisms may have upon individuals. With lowered resistance due to the pressure of speeded production in industry, the effect is almost certain to become more damaging. Totally aside from any considerations of disease, however, common decency rebels against the thought of what has been unpleasantly but realistically termed "swapping spit."

The installation, whenever possible, of paper cups and utensils which are used once and thrown away should be encouraged. Health authorities are agreed that such service constitutes the most healthful, convenient and certain solution to the problem of sanitation in public eating places. Where single-service paper cups are not used, the following methods for washing dishes are recommended by the Subcommittee on Standard Methods for the Examination of Dishwashing Devices of the Committee on Research and Standards of the American Public Health Association:

FOR HAND WASHING:

1. An adequate amount of soap or other detergent should be used to remove grease.
2. The temperature of the soapy wash water will be as high as can be withstood by the hands—110° to 120° F.
3. The soapy wash water should be changed at frequent intervals and at no time should it have a bacteria count of more than 50,000 organisms per cc., nor should it have gross food particles in suspension.
4. The washed eating and drinking utensils may then be placed in:

(a) A disinfecting tank of hot water, the temperature being not less than 170° F. The period in the hot water must not be less than one minute. Pouring scalded water over washed utensils is not adequate for disinfecting purposes.

(b) A chlorine bath. The chlorine content of the solution must be 200 p.p.m. The first rack of utensils should remain in the chlorine bath while a second rackful is being washed, since merely a dip or brief rinse in the bath is not sufficient.

FOR MACHINE WASHING:

1. The temperature of the soapy wash water and the rinse water shall be not less than 170° F.
2. An adequate amount of soap or other detergent should be used in the wash water to remove grease.
3. In the rinsing process a sufficient amount of fresh hot water should be used so there will be frequent change of the soapy wash water.
4. Dishes and glasses should be allowed to drain dry. Towelling is to be discouraged.

WITH adequate dishwashing may be coupled the periodic health examination, which long has been regarded as an integral part of preventive medicine. The aims of such examinations are to keep general resistance at optimum level; to detect any suspicious physiologic disturbance that might portend a serious condition, and to control at the earliest possible stage diseases that might arise; and finally to educate the layman to the importance of right living habits, to impress upon him the necessity for recognizing symptoms of certain diseases and to report any such symptoms promptly.

Compulsory physical examinations have been given in many cities to food handlers in an effort to prevent the spread of certain communicable diseases. Presumably given every six months or year, the examination often has been limited to tests to discover a few food-borne diseases. In New York City, for example, the examination for food handlers was concentrated on a search for typhoid carriers. The number of carriers isolated over a period of many years was so small, however, that in 1935 the ordinance requiring compulsory examinations of food handlers was discarded by the New York City Health Department. Since then many other communities have repealed similar regulations. Health officials point out that food handlers may become infected the day following an examination, thus going undetected for six months or a year till the time for another examination rolls around. Such examinations, therefore, are felt to give a "false sense of security." Much better results, officials now believe, can be obtained at less cost to the community through education of food handlers and rigid control of food handling and dishwashing procedures.

Though the periodic health examination for food handlers, as a routine procedure for disease control, has fallen into disuse, the general health examination for industrial workers may still prove advantageous. Its aims, as defined above, are broader than those of the examination for food handlers. The general health examination is not intended merely as a guarantee of freedom from communicable disease. Experience has shown it has the effect, actually, of encouraging lay attention to danger symptoms and more frequent visits to the physician. Its keynote is *prevention.*

Attempts to build up general resistance of employees may utilize present knowledge of vitamin therapy. Mass administration of vitamins, in an attempt to ward off an exodus of workers during the month of February, was undertaken for the first time in this country at the plant of the Continental Machines, Inc., Minneapolis, Minnesota, this past winter. The plan was conceived by Leighton A. Wilkie, president of the corporation, who, aware that most of his workers fell victims of the cold virus during the long, severe Minnesota winters, was fearful that production of machine tools in his plant would be seriously hampered. He suggested dispensing vitamins to build up the resistance of employees. The company doctor accordingly arranged for the distribution of capsules containing the following vitamins:

Vitamin A	10,000 International Units
Vitamin D	1,000 International Units
Vitamin B_1	25 International Units
Vitamin B_2	10 Sherman Units

Approximately 400 workers participated in the plan. Every morning at 10:30, during a 10-minute rest period, each worker was handed a capsule in a single-service paper cup. The vitamins were taken from December 20 to March 31, and during that time, though the general population in Minneapolis had felt two or three severe cold and influenza epidemics, there were only eight absences of workers at the plant due to illness. This record, plant officials declare, is "far better" than any previous record. In the past, it was pointed out, half the employees were usually absent owing to colds during the first part of February, while the remainder, perhaps infected by the first victims, were incapacitated during the latter part of the month. Officials, while cautious in placing too much emphasis on the benefits of the vitamin therapy, nevertheless feel the project proved "very beneficial."

The worth of general health examinations will depend largely upon the willingness of the employer to engage a full-time medical director and to provide him with adequate facilities for the examinations. At the time of the survey by Bloomfield and Neal a few years ago, 85% of American industries lacked full-time medical supervision. A survey made a few months ago by the National Association of Manufacturers disclosed that industries questioned had spent $23,000,000 on health programs in the past year, instituting more than 2,000 special reforms including the hiring of full or part time medical directors and nurses. To fill the demand for industrial physicians which, it is hoped, will increase considerably, the National Committee on Medical Preparedness of the American Medical Association is organizing a program of training in this field.

The actual examination, many authorities agree, should include a fluoroscope examination for every employee. According to Surgeon-General Thomas A. Parran of the U. S. Public Health Service, there should be stations for dispensing sulfanilimide. "There must be machinery to detect active cases of tuberculosis," Dr. Parran continues. "It should be possible promptly to find

and to isolate all sources of infection. Recent developments in the small and micro-film techniques mean that we can easily afford it." One large industrial plant in Illinois has, since 1938, conducted "physical examinations of all employees on a continuing basis." The program consists, first, of an interview with one of two fulltime registered nurses employed by the firm, who obtains a history of the employee. At the conclusion of the interview a urine analysis is made. The employee is then scheduled to return later for his examination by the medical director. This consists of a "very complete 'strip' examination with special attention given to heart, blood pressure, lungs, skin, extremities, joints and musculature, eyes, ears, teeth, nose, and throat. Kahn tests for syphilis, x-rays of the chest and electro-cardiograph tracings are also made." The only joker in this program is that the medical director is employed on a part time basis and thus is able to give each employee an examination only once in every two years. It is moreover a program designed for peacetime, and the exigencies of production today demand the presence of full time medical directors who will give general examinations, fully as complete, to every new employee and to all other employees every six months or year.

Respiratory diseases are, then, the industrial physician's first concern. They may be controlled not only through education, and early detection, through periodic physical examinations, but also through the employment of "routine epidemiologic procedures;" in other words, by encouraging the use of single-service paper cups and utensils, or of thoroughly sanitized glass- and table-ware, in all eating places patronized by workers, inside as well as outside the plant area, to block the routes of travel of respiratory diseases.

Occupational Dermatoses

—Diagnosis, Prevention and Treatment—

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IT IS important to determine whether a dermatitis from which a worker is suffering is of industrial origin (1) because it has a direct bearing on the treatment of the case and on the prevention of its recurrence; (2) because of the compensation involved; and (3) in order to determine who pays the physician's fee.

If it can be determined that the dermatitis is due to exposure to certain occupational skin irritants, then the major portion of the treatment consists in preventing further contact with these irritants; that is, removing the patient from his working environment, or providing him with suitable protective clothing. In such cases the prevention of the recurrence of the disease consists in preventing contact with the offending material, either by methods stated above or by installing proper safety measures, such as totally enclosed processes, adequate ventilation, clean work rooms, clean clothing, etc.

The compensation laws in many of the states are so worded that if a physician undertakes to treat a worker and he makes a diagnosis that the disease is of industrial origin, then his fee is assured, either by the compensation commission or by the insurance carrier. But if, after treating the patient, the physician should determine that the dermatitis is not of industrial origin, the employer or insurance carrier will not pay for the treatment, and the physician must look to the patient for his compensation. It can be readily seen that this has a tendency to make the physician lean toward a diagnosis of industrial dermatitis, because his chances of being paid a fee by the sick worker is uncertain. It would be to the advantage of insurance carriers and compensation boards to devise means to remedy this condition.

Many cases of occupational dermatitis can be diagnosed at sight if the worker's occupation is known, because certain classes of industrial skin irritants cause more or less characteristic types of skin changes, and the appearance and location of the lesions are characteristic of the occupation or of the irritant. For instance:

1. Paronychia and onycholysis are common lesions among fruit and vegetable canners.

2. Such corrosives as soda ash, caustic soda, lime and chromium compounds cause similar types of ulcers. The morphology of such ulcers is not characteristic of any particular corrosive, but ulcers are characteristic skin lesions of all corrosives.

3. Acne-like lesions, folliculitis, boils and keratoses which may develop into epithelioma are characteristic skin lesions caused by petroleum oils, coal tar and their derivatives. The forearms and the extensor surfaces of the thighs where the soiled work clothes touch the skin, are the most frequent sites of the lesions. Workers in petroleum refineries, coal tar distillers, paraffin pressmen, workers preserving wood with coal tar distillates, such as creosote oil, workers with coal tar pitch, such as roofers, road builders and conduit makers, machinists and mechanics using cutting oils may all be affected with such occupational dermatoses. Skin cancer of the upper extremities and of the scrotum are comparatively frequent among these workers and are due to the keratogenic substances in petroleum and coal tar. Melanosis is quite common among workers exposed to pitch and its fumes. Coal tar pitch also causes photosensitivity especially among those workers who do not develop melanosis.

4. The chlorinated naphthalenes which are manufactured by combining chlorine with the coal tar derivative naphthalene, also produce acne-like lesions on the exposed parts of the body as well as on the covered parts if the clothing becomes soiled with the chemical.

5. Chlordiphenyls which are made by combin-

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ing chlorine with diphenyl, a double benzene ring in which chlorine is substituted for some of the hydrogen atoms, also produce acne-like lesions.

The lesions caused by certain occupational diseases of bacterial origin are characteristic in their appearance, as for instance, the malignant pustule of workers handling the hides of anthrax-infected animals, and erysipeloid, a disease occurring usually on the hands of workers handling infected pork products or fish.

While the appearance of lesions caused by certain classes of industrial skin irritants is more or less characteristic in their morphology, yet the eczematoid types of occupational dermatitis look alike and give no clue to the causative agent. Such eczematoid types of occupational dermatitis are usually caused by the affected worker becoming allergic to some substance, which, under similar circumstances, does not affect the majority of the workers. In order to discover the actual cause of such a dermatitis, all of the following factors must be considered: (1) history; (2) site of eruption; (3) morphology; and (4) the results of patch test, before a diagnosis of occupational dermatitis can be made.

1. HISTORY. The history of the dermatitis is most important. In order for the dermatitis to be considered as of possible occupational origin, it must be brought out that such a dermatitis was not present before the patient entered on the occupation. It must also be shown that the dermatitis developed during the period of industrial exposure, or after a lapse of a reasonable incubation period since the cessation of exposure. This period should not be over 10 days. If the history shows that other workers similarly employed are similarly affected, or that new workers at the process are usually similarly affected, then the possibility of a diagnosis of industrial dermatitis is strengthened. If the history should disclose the fact that the patient has had similar attacks of dermatitis previous to the present exposure, then the possibility of the present attack being due to his occupation is weakened, but not necessarily entirely done away with, because it may be possible that in his previous employment he may have met with the same irritant or conditions which are now causing his dermatitis. Knowledge by the physician of the working processes in which the patient is engaged and the substances with which he comes in contact is important, because this enables him to know whether the worker is exposed to known irritants or to conditions which tend to cause dermatitis. For instance, if a worker appears with a dermatitis of the hands and forearms and states that he works on a rubber-mixing mill, then we know that he is exposed to irritant rubber compounds and is more likely to develop an occupational dermatitis than is a rubber worker who handles only cold vulcanized rubber objects. If the history shows that the dermatitis developed whenever the worker was at work, got well or improved when he was away from work and again recurred when he returned to work, then the history itself establishes a definite cause and relation factor between the worker's occupation and the dermatitis.

2. SITE OF ERUPTION. The site of the eruption is also important. In examining patients, they should be completely divested of clothing. This may in many cases reveal areas of dermatitis on portions of the body not complained of by the patient and may give the clue to a proper diagnosis. Occupational dermatitis usually begins on the exposed parts—the hands, the fingers and the forearms, if the offending material is a solid or liquid; and also on the face and neck, if it is a vapor. The covered parts of the body may also be affected, if fumes or vapors penetrate the clothing, or if the clothing is not frequently washed and becomes saturated with irritant chemicals. Thus, dermatitis may occur on the body of the worker handling irritant dusts which penetrate the clothing, such as finely powered rubber compounds; or dermatitis may occur on the covered parts of the body when the clothing becomes saturated with petroleum oils and waxes, especially if the worker does not take daily cleansing baths and if he does not change his work clothes daily.

Occupational dermatitis is also often found at points of friction on the body. The wrist where the ends of the gloves or the sleeves rub, the belt line where the belt or the top of the trousers causes friction, the ankle at the shoe tops, and the neck at the collar line, are all sites where friction aids the action of industrial irritants. Sometimes a dermatitis of undoubted occupational origin may become generalized. This occurs when the irritant is one to which the worker has developed a high degree of sensitivity. Many substances are known to be sensitizers. Nitro, nitroso and the chloro compounds are notorious sensitizers. In some instances a primarily localized dermatitis or burn may also sensitize the patient and a few days later a generalized dermatitis may develop.

3. MORPHOLOGY. An industrial dermatitis of the acute eczematoid type begins as an erythema followed by papules and vesicles and, when the vesicles break, by an oozing and crusting, no matter what irritant is the cause.

4. It is here that the patch test is of diagnostic value. Patch tests should be performed only by those familiar with the technique and with the interpretation of results; otherwise patch testing may lead to false conclusions. It is important to know on what portions of the body and how the patch test should be applied; also how long it may be allowed to remain on the skin; also in what stage of the eruption it is safe to apply the patch test.

If the worker is handling known irritants and his fellow workers are also affected, the cause is obvious and the patch test is unnecessary; but if he is the only one of the group who is affected, then he should be patched with the materials with which he comes in contact in the course of his occupation. If he is patched with only one substance, then a control patch should be placed on him. If he is patched with more than one substance, then any negative reaction from one of these substances serves as a control. It is also desirable to

use as a control one of the workers who has no dermatitis.

In patching with solids, the best results are obtained by moistening them, preferably with perspiration from the patient which can be obtained from the axilla.[1] Sometimes it may be necessary, in order to obtain a reaction from a patch test, to use perspirations of different hydrogen ion concentrations. One must always keep in mind that patch tests do not simulate working conditions in which heat and friction may augment the action of the irritant, therefore the results of patch tests must be correlated with the worker's particular occupation, the history of the dermatitis, and the site and morphology of the lesion, in order to arrive at a correct etiology. Patch tests are only a link in the chain of evidence on which a diagnosis of industrial dermatitis is made. A positive reaction only shows that the portion on which the patch was applied was at that time sensitive to the substance with which it was patched. In order to state that this substance was the cause of the occupational dermatitis, we must be sure that the patient was exposed to the substance in the course of his work and presuppose that the patient's skin was also sensitive at the time of industrial exposure.

When negative results are obtained from patch tests with the materials met with in the course of the patient's occupation, we must not hastily conclude that the dermatitis is not of industrial origin, because: (1) the skin area over which the patch was placed may not be hypersensitive; (2) if the eruption has disappeared, the patient may no longer be sensitive when the patch test is performed but may have been sensitive at the time he had the eruption and when he was industrially exposed; (3) a negative patch test reaction may be due to the fact that the patch test never accurately reproduces actual working conditions, such as friction, maceration, heat, cold and sunlight, which may be additional factors adding to the irritating effect of the substance to which the patient is exposed; (4) it may be that the amount and concentration of the chemicals applied as a patch test may not be as great as they actually were during industrial exposure; and finally, (5) the actual industrial irritant may not have been discovered and applied as a patch test. When negative reactions are obtained from patch tests with substances encountered in the work room and the dermatitis which the worker has resembles a contact dermatitis, an effort must be made to perform patch tests with materials met with in the patient's home which may be the causes of dermatitis. For instance, certain plants, or perhaps paints or even new furniture. Tests of this kind will in some cases show that the patient is sensitive to materials met with outside of industry and not sensitive to the materials which he meets in his place of employment.

The technic of performing patch tests is important in obtaining and evaluating results. When patch testing for hypersensitivity to general irritants, such dilutions must be used in the tests as are not known to irritate the normal skin.[2] The insulating material inserted between the chemical and the adhesive plaster should be a non-irritant substance, such as unvarnished cellulose or, better still, a thin sheet of mica. The resin on waterproof cellophane itself may be an irritant, as may be some of the compounds in dental rubber. The adhesive plaster used to hold the patch in place often itself causes an erythema of the skin.[3]

At the time the patches are removed there may be no reaction present, but some time later—a few hours to a few days—a delayed reaction may develop at the site of the patch. There is some dispute as to the significance of delayed reactions. Some hold that the skin was sensitized by the patch test, but I think that in our present state of knowledge we should regard delayed reactions as denoting hypersensitivity but to a less degree than do undelayed reactions. Patch tests properly performed and evaluated can be of great help in the diagnosis of industrial dermatitis, but, if improperly performed and evaluated, they may lead to confusing and unjust conclusions.

Differential Diagnosis

OCCUPATIONAL dermatitis must be differentiated from such diseases as seborrheic dermatitis, fungus infections, lichen planus, impetigo contagiosa, pityriasis rosea, erythema multiforme, drug eruptions, neuro-dermatitis and dermatitis due to contact with irritants encountered outside of the place of occupation.

The industrial physician or general practitioner may at times be in doubt about the diagnosis of these conditions in a worker exposed to an occupational skin hazard, especially if he does not strip the patient and examine the entire surface of the skin. The dermatologist may have less difficulty because he is more familiar with the characteristic location and appearance of the various skin diseases other than contact dermatitis. However, the presence of other skin diseases does not rule out the fact that an industrial dermatitis may also be present. In fact, the presence of certain skin disease often predisposes a worker to an industrial dermatitis, because defense mechanism of the skin is impaired by the presence of these skin diseases, and external irritants have a better opportunity to attack the true skin.

The greatest difficulty in differential diagnosis is presented by dermatitis caused by contact with irritants encountered outside of the place of occupation. The lesions are similar in appearance and site to that of occupational dermatitis, and only the most careful consideration of all the facts can lead to a correct etiology. The patch test is invaluable in making such differentiation.

I again caution against using primary skin irritants, such as strong acids or alkalies or undiluted volatile solvents, as patch tests. Only such concentrations of chemicals should be used as have been found by experiment to be harmless to the normal skin when used as patch tests.[4]

It is also important, if there is no reaction to the patch test at the time it is removed, that the patient

be kept under observation for a period of five days at least, in order to wait for the development of late reactions. We have found in many cases that late reactions occur when the patient is only mildly sensitive to the concentration of the chemical used in the patch test. In such cases, the reaction appears in a shorter period of time if the concentration of the chemical applied is greater. In other words, the length of time it takes before the reaction appears depends not only upon the sensitivity of the patient, but also on the concentration of the irritant as well as the length of time the irritant is permitted to stay on the skin, and the amount of the irritant used in the patch test. The latter must be considered because the secretions of the skin may be able to buffer a few drops of a certain substance when used as a patch test, but not be able to buffer larger amounts.

Fungus infections also offer a problem in differential diagnosis from industrial dermatitis. A large percentage of workers are affected with mycotic infections in some form or other. Epidermophytosis, trichophytosis, tinea cruris and tinea versicolor are common skin diseases. Allergic reactions in the form of dermatoses on distant parts of the body resulting from these fungus infections are recognized by allergists and dermatologists. These allergic reactions or phytids may be confused with industrial dermatitis. If the phytids or the mycotic infections appear on portions of the body not exposed to industrial irritants, they are not so apt to cause doubts in diagnosis, but they often appear on the hands and here they are apt to cause trouble in diagnosis. The various tests with fungus extracts, such as tricophytin, are of little value in making a differential diagnosis because nearly every one has or has had a fungus infection, and positive reactions are the rule. They are of more value when the tests are negative, because they then tend to show that the present eruption is not of fungus origin, although even here it is not absolute proof, because among other reasons the causative fungus may not be the one from which the testing extract is made. Then again, the fact that a worker has a fungus infection does not preclude the fact that he may also have an industrial dermatitis. In fact, it is held by some dermatologists that the presence of a fungus infection predisposes to hypersensitivity to other external irritants, and we have seen many cases where the fungus infection or the phytid was the site of a chemical dermatitis or an ulcer. Patch testing may offer some help but here again the industrial exposure, the history of the eruption, the site of the lesions and their morphology must all be carefully considered before an etiologic diagnosis is made.

Chronic eczemas, more or less generalized and of long standing, offer very difficult problems in etiology, especially when they are complicated by secondary infections. Patch tests are of little value in most of these cases, because polysensitivity is usually present. It is impossible to determine whether the dermatitis and polysensitivity were caused by industrial exposure, or whether the sensitivity was present before the industrial exposure, or whether the dermatitis and sensitivity were caused by exposure to substances encountered outside of the workroom.

Cases sometimes appear before compensation boards claiming compensation for disability due to a dermatitis which the worker claims to have suffered as a result of his occupation, but which at the time the case is being heard, has disappeared. In these cases, it is also difficult to determine the causative factor. If patch tests done at this time are positive, they are of great help, but if negative, they are not, because the patient may have developed an immunity by his recovery.

From these facts it can be seen that there is no one characteristic symptom on which a diagnosis of an industrial dermatitis can be made. The worker's occupation, the history of his skin eruption, its site and morphology and evaluation of the patch tests must all be taken into consideration by a dermatologist familiar with the substances and the processes of the worker's occupation before he can hope to make a true diagnosis as to the etiology of a dermatitis in a worker exposed to an occupational skin hazard.

When a physician has a patient with dermatitis and the question of the occupational origin of the dermatitis arises, the physician should make such a careful record of all the facts and findings in the case and make these records in such a manner that the laymen who compose the compensation board, reading the physician's record, may understand the basic facts on which a diagnosis was made. Below is a suggested form, and it will be noted that if the questions are properly answered, all the facts on which a diagnosis of occupational dermatitis should be based, are brought out.

SKIN CLINIC

Date .....
Name ..... Age ..... Race .....
Type of Skin: (Dry Moist) (Thick Thin Parchment-like) (Dark Light Freckled Chapped)
Previous Skin Diseases .....
History of Allergy (hay fever, asthma, plant poisoning, etc.) .....
Name of Employer .....
Manufacture What .....
Briefly Describe Work .....
Present Work Began .....
Present Disease Began .....
Chemicals or Substances Contacted .....
Describe Lesions .....

PATCH TESTS PERFORMED

Substances	*Concentrations*	*Time*	*Reactions*
.....	.....	.....	.....
.....	.....	.....	.....

Dermatitis Caused By .....
Diagnosis Based On .....
Treatment Given .....
Preventives Advised .....
Advised Cease Work ..... How Long .....
Remarks .....
.....
.....

Prevention

THE ideal prevention is to safeguard the operations so that injurious chemicals do not come in contact with the skin. This can be done by installing totally enclosed processes. Modern factories are being built so that the worker need not come in contact with any of the chemicals used from the beginning of the manufacturing process to the very end. New chemicals are brought to the factory in enclosed railroad cars, emptied by suction hose into enclosed storage containers from which they are sent through a closed system to the various retorts and kettles by merely turning valves. From the kettles the finished product is processed in totally enclosed machinery, such as filters, grinders, etc.. and placed into closed shipping containers by means of pipes or hose. In some industrial processes where this is not possible, or where old equipment is used, the workers must be protected by being compelled to wear suitable protective clothing such as rubber gloves, aprons, masks, and goggles.

Protective clothing against skin irritants should be made with special consideration of the particular chemical which causes the hazard. Fabrics, such as rubber, which give protection against the action of alkalies and acids, may not be effective against petroleum oils and volatile solvents, such as carbon tetrachloride, trichlorethylene, carbon bisulphide, benzols, and esters used in spray painting.

In addition to rubber, to which some workers object, and which in some instances has caused dermatitis, there are now available light, transparent, impermeable, non-inflammable, and inexpensive materials, made of synthetic resins, from which efficient protective clothing and even elastic gloves can be made. Pliofilm, made by Goodyear; Koroseal, made by Goodrich; and Vinylite, made by Union Carbon and Carbide, are examples of such resins. These materials will in some instances be more serviceable than rubber, and workers as yet have no prejudice against them.[5]

Gloves should be long enough to cover part of the forearm, and they should be tucked under the sleeves. The sleeves should be made of impervious material and fasten over the gloves around the wrist in order to prevent the irritant from entering the gloves. In some operations, such as fruit and vegetable canning, synthetic resin molding, dishwashing, and at soda fountains, only sleeves, gloves, and aprons are necessary, but in such operations as spray painting, or working in places containing large amounts of irritant dusts, it is necessary to have impermeable coveralls, hoods, and respirators. The face should be greased with lanolin before respirators are put on to prevent skin irritation from the respirator. The filters of respirators should be frequently cleaned. Gas masks should be used against irritant fumes. Boots or shoes should be covered by the trouser legs to prevent dust from entering. All protective clothing should be frequently inspected and kept in good repair and cleaned daily. In jobs where there is a marked skin hazard, clean protective work clothing should be supplied by the management.

Over the processes from which are given off irritating dusts or fumes, special suction ventilating apparatus should be installed so that the irritants cannot come in contact with the worker. The work rooms themselves should have proper and adequate ventilating equipment so that dusts and fumes have no chance to accumulate in any dangerous concentration. Rules for the use of protective measures should be enforced.

Cleanliness is of prime importance. The floors and walls of the work rooms should be kept scrupulously clean, as should all machinery. Convenient shower baths should be installed and the workers should be compelled to take baths after work. The use of strong soaps and harsh cleansers should be prohibited. We have found that a cleanser consisting of 98 parts of neutral sulphonated castor oil and two parts of a wetting agent will clean the skin, without irritating or defatting it. Its detergent action can be reinforced without materially increasing its irritating properties by adding to it 1% to 2% of trisodium phosphate.

In the factories where there are special skin hazards, a double set of locker rooms should be provided, that is, one for street clothes and one for depositing the soiled work clothes. In this way the worker coming to work will enter the first locker room where he will strip and leave his clothes in the locker. From there he proceeds through a hall to the second locker room where clean work clothes are waiting for him. From this locker room he proceeds to his work. At the end of the work shift, he enters the locker room in which he had put on his clean work clothes. Here he deposits his soiled work clothes and goes to the shower baths. From the shower baths he proceeds to the locker room where he had left his street clothes, puts them on and goes home.

There are many protective ointments on the market designed for the prevention of industrial dermatoses. These ointments are supposed to act by forming a protective film and thus preventing the irritant from coming in contact with the skin. Some of them are useful, others only imperfectly perform their function. They may be easily rubbed off during work or may be washed off by the perspiration. Some of them may offer protection against a particular chemical. There are very few of them, however, which can protect against strong alkalies. There are instances where a protective ointment may be of value, especially if used during the time pending installation of better protective measures. Protective ointments are usually washed off by the workmen before leaving the factory. This act also removes the irritant chemicals from the skin and is no small part of the protection supposed to be given by the ointment.

Protective ointments should be prepared individually for the special hazard. No one ointment protects against all hazards. They should form not only a protective film to prevent the irritant from touching the skin, but also fill the pores of the skin with a bland grease to prevent the entrance of the irritant, and should, if possible, contain a non-ir-

ritant chemical neutralizer of the irritant. They should also act to replace fat that may be absorbed from the skin by the occupational exposure.

Ointments, however, should never be relied upon as the sole preventive against skin irritants; they should be only temporary expedients pending the adoption of better safety measures.

New applicants for work should be carefully examined, and those having skin conditions which predispose them to occupational dermatitis should not be employed in occupations where there is a skin hazard. We do not advocate pre-employment patch testing, because it will not reveal which workers will become sensitized after industrial exposure, and because of possible legal complications.

The workers should be encouraged to report to the medical department all irritations of the skin, no matter how trivial. There should be frequent medical examinations of the workers to discover the presence of skin diseases which have not been reported. The physician in charge should acquaint the workers with the skin hazards and should have a working knowledge of dermatology in order to give proper treatment for skin cases, or if he does not have such knowledge, dermatological cases should be referred to a consulting dermatologist.

Treatment

A FEW words as to treatment. Only the mildest lotions and ointments should be used in the treatment of acute cases of occupational dermatitis. The lotions, such as boric acid and calamine, when there is a moist dermatitis, and the ointments when the dermatitis is of the dry type or has reached the crusting stage. The addition of small amounts of anti-pruritics, such as phenol and nupercaine, may be indicated if the itching is severe. The application of irritant medicaments, such as salicylic acid, ammoniated mercury, tar, sulphur, and x-rays, is contra-indicated in acute contact dermatitis. We have seen many cases of occupational dermatitis kept active by too vigorous or irritating treatment. After all, the main curative measure in most cases is to remove the irritant from the worker, or the worker from the irritant, and nature will take care of the rest. Of course, if the case is complicated by pyogenic or fungous infections, then these must be treated after the contact dermatitis has subsided.

Mild cases of occupational dermatitis should be furnished with protective clothing, or protective ointments, and treated with only the mildest medicaments and continued at work with the hope that they will develop an immunity and get well while working, which a great many do. The workers themselves call this becoming "hardened." It is a mistake to take every case of occupational dermatitis off the job before giving him a chance to become "hardened." Such severe cases of occupational dermatitis as cannot continue working, and those mild cases which cannot get well while working, ought to be removed from the job and given appropriate treatment in order to recover. If the dermatitis is purely of occupational origin, and there are no complications, there should be marked improvement or entire recovery, say, within a period of two months. Those cases, which cannot get well while working should not be returned to their work, because most of them will again develop dermatitis. They should be given other occupations.

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Syphilis Control

—Conference on Serology and Syphilis Control, University of Michigan, June 7, 1941, sponsored by the American Association of Industrial Physicians and Surgeons in cooperation with the United States Public Health Service and the American Social Hygiene Association, Michigan Union, Ann Arbor, Michigan—

Reported by

C. O. SAPPINGTON, M.D., DR. P.H.

THIS important conference attracted men from all over the country, not only from various industrial groups, but also from official associations and governmental bodies. The program follows:

Presiding Officer: DR. CASSIUS H. WATSON, Chairman, Syphilis Control Committee, American Association of Industrial Physicians and Surgeons; Medical Director, American Telephone & Telegraph Company, New York.

"Serology and Syphilis Control in Industry"—DR. G. H. GEHRMANN, Medical Director, E. I. du Pont de Nemours & Company, Wilmington, Delaware.

"Serology and Syphilis Control in Industry"—DR. HAROLD A. VONACHEN, Medical Director, Caterpillar Tractor Corporation, Peoria, Illinois.

"Syphilis Control as Viewed by the Syphilologist"—DR. UDO J. WILE, Professor of Dermatology and Syphilology, University of Michigan Medical School.

"Newer Studies in Serology of Syphilis"—DR. REUBEN L. KAHN, Chief of Clinical Laboratories, University of Michigan Hospital.

"The Quantitative Kahn Reaction"—DR. WALTER M. SIMPSON, Director, DR. H. WORLEY KENDELL, Assistant Director, and DR. DONALD ROSE, Associate, Kettering Institute for Medical Research, Dayton, Ohio.

"A Workable Plan for Syphilis Control in Industry"—DR. E. A. IRWIN, Medical Director, Fisher Body Company, Cleveland Plant, Cleveland.

"A Syphilis Control Program in an Industrial Center"—DR. MILLARD C. HANSON, Director, Pittsburgh Syphilis Control Program, Pittsburgh.

"A Proposed Plan for the Control of Venereal Disease in Industry"—DR. OTIS L. ANDERSON, P. A. Surgeon, V. D. Control Officer in Industry, District No. 3, U. S. Public Health Service.

"Serology and Syphilis Control in U. S. Army"—DR. JAMES H. GORDON, Captain, Medical Corps, Representing the Surgeon-General, U. S. Army.

"Serology and Syphilis Control in the U. S. Navy"—DR. HAROLD W. SMITH, Rear Admiral, Medical Corps, Representing the Surgeon-General, U. S. Navy.

LUNCHEON SESSION—Presiding Officer: DR. T. LYLE HAZLETT, President, American Association of Industrial Physicians and Surgeons; Medical Director, Westinghouse Electric & Manufacturing Co., Pittsburgh.

A Word of Welcome—DR. ALEXANDER G. RUTHVEN, President, University of Michigan.

"Syphilis Control in Industry and National Defense"—DR. R. A. VONDERLEHR, Assistant Surgeon General, Chief, Division of Venereal Diseases, U. S. Public Health Service.

"Educational Aspects of Syphilis Control"—DR. JOHN SUNDWALL, Director, Division of Hygiene and Public Health, University of Michigan.

"Social Hygiene and the Defense Industries"—DR. WALTER CLARKE, General Director, American Social Hygiene Association, New York.

"Importance of Syphilis Control in Industry"—DR. CLARENCE D. SELBY, Medical Consultant, General Motors Corporation, Detroit, in behalf of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS.

CONCLUDING REMARKS—DR. CASSIUS H. WATSON. In behalf of Syphilis Control Committee, AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS.

Morning Session

CHAIRMAN WATSON stated in his introductory remarks that this was the second conference on syphilis control sponsored by the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS. DR. WATSON has been much impressed by the work which has been done at Mt. Sanai Hospital in New York City and recommended the reading of the report of this investigation. The survey was based on experience with patients having no treatment, and the significant figures showed that 65% of the persons were clinically well but had positive serology.

DR. G. H. GEHRMANN, in discussing the subject "Serology and Syphilis Control in Industry," stated that the experience in his company dated from 1935. There were many chemical exposures in this organization which made diagnosis difficult and aggravation allegedly common. Some of these were mentioned, namely lead encephalitis and carbon monoxide poisoning, which presented peculiar problems.

Experience taught that the state laboratories were unsatisfactory, so the company finally set up its own laboratory for serological work, specimens being sent there from the 90 different plants of the company. It is the custom to segregate luetics from certain types of exposures, particularly lead, carbon disulphide, nitrates and nitrites, and also from operations in cellophane because the latter is used for wrapping food.

Certain difficulties have been encountered with reference to adequate treatments as rendered by the family physicians; to meet this problem, a check-up has been arranged to see the individual once a week, and contacting the private physician once a month. Of course, this takes time and personnel, but it is worth while. Eighty percent of the personnel involved had become negative in their serology in a period of somewhat over two years.

Another problem which presented itself was the variation in the two divisions of construction and operation in this company. The patient often gives the wrong address on construction jobs and in that type of work, only 10% apparently take treatment, as compared with 90% who take it on operation jobs.

Prior to 1938 there were 73,735 persons examined, showing a positive result in 4.4%. Within the past year, from June, 1940, to June, 1941, there were 65,783 persons examined, with a positive serology of 2.9%.

The results of these experiments show the difficulty in getting the patient to accept treatment and also the problem with the family physician to give adequate treatment. However, the company is getting more and more negatives, and the program will be continued. The advantage of having its own laboratory (with a personnel of two technicians, a clerk and helper) is well illustrated by the volume of tests capable of being handled—900 tests a day at about a cost of 10 cents each.

DR. HAROLD A. VONACHEN, in presenting the subject "Serology and Syphilis Control in Industry," stated that he would try to avoid duplication of DR. GEHRMANN'S presentation and would talk especially of the plans in his own organization.

Plans for syphilis control in this company must be acceptable to the different types of groups involved. First an interview is given and then a physical examination and tests follow. If the Kahn test is positive, there is a personal interview, the individual being told confidentially that he has a positive blood—he is never told that he has lues. He is then sent to his family physician, the information being confidential between the plant physician, the family physician, and the employee. Employment can be continued as long as treatment is continued. A re-check is always possible because of using the Kahn antigen. After treatment has been stopped, the employee returns every six months for a check-up and a continuation of treatment, if necssary.

There has been a decreased incidence, of 2% in 1936 to 1.5% in 1937, 1.8% in 1938, and finally 1.05% in 1939. At present there are 149 cases; 39 cases have taken over 30 months' treatment and are still positive. There are no negroes involved in these figures.

This plan benefits both employee and employer and would be of benefit to insurance companies (this company carries its own insurance). The speaker deplored the lack of knowledge concerning adequate treatment on the part of private physicians. Although the plan is not perfect, it can be improved; but it is certainly humanitarian.

In concluding, DR. VONACHEN proposed two questions: (1) Are we benefitting men by giving them treatment, through the prevention of tertiary changes; and (2) should the verification test always be done?

DR. UDO J. WILE discussed the subject, "Syphilis Control as Viewed by the Syphilologist."

This subject is to be seen from four different points of vantage: (1) from that of the Surgeon-General's group; (2) that of the consulting physician to industry; (3) that of the teacher; and (4) that of the practicing physician.

Certain difficulties present themselves immediately: (1) syphilis is not comparable to any other communicable disease; (2) the possibility of quarantine is more difficult, because of the absence of acute illness; (3) the disease is known by its occultism (absence of tangible physical evidence); and (4) in connection with the various changes in treatment, considering the state of flux and the toxic reactions, problems are also presented. It was emphasized that the problem of most importance is No. 2. Another difficulty is the absence of sufficient clinical material for teaching at the present time, on account of principles of prevention and control being put into effect.

In answering DR. VONACHEN'S questions, it seems wise to say that there are too many instances of treatment based only on the serology results—one must also have a competent examination. Even in asymptomatic cases, there is evidence which proves the avoidance of late sequelae. If we could treat all individuals early, there would be few late sequelae. We should be able to assure the patient that his life will not be shortened, either by his infection or by treatment.

DR. RUEBEN L. KAHN, in presenting "Newer Studies in the Serology of Syphilis," stated that he would change the plan of discussion a little. In answering the questions of DR. VONACHEN relative to verification tests, he would propose the following: If consultation is possible, let the syphilologist make the decision and on those who are suspected, do the verification test. The test cannot be used routinely because of its complexity.

There is a new slant now on false positives—they mean that there is some definite pathology other than that caused

by lues. There are some instances where repeated verification tests are really necessary. In conclusion, the final decision must be made by the clinician in the majority of instances.

IN THE absence of DR. WALTER M. SIMPSON who was to talk on "The Quantitative Kahn Reaction," DR. REUBEN KAHN discussed the subject briefly. The group at Dayton have contributed a great deal with reference to the use of the quantitative serology reaction. The data were sent from this special group where specific procedures were used.

Using a titer of 120 to 0, the cases under treatment became negative in five months, and using a titer of 360 to 0, cases became negative in seven months. No relationship was established between the titer and clinical condition. A case of resistant late lues was encountered.

Illustrative curves were shown, depicting the results of early primary treatment by a combination of fever and chemotherapy, showing that at about 80 days there was a negative reaction. In complicated early cases, there were 21 months before a negative reaction was obtained in one instance, whereas others showed a negative reaction in four to 12 months. These figures and the experiences show the value of quantitative serological procedures.

DR. E. A. IRWIN, in presenting "A Workable Plan for Syphilis Control in Industry," found it rather difficult not to repeat certain important principles which had been enunciated by previous speakers.

The physician in industry should act as the case-finding agent. In this company, blood specimens are taken on all examinations, including pre-employment, re-employment of over one year, and periodics of over one year. A code number is used on the examining card and extreme care is taken in maintaining the confidential relationship as in private practice.

An interview is arranged with the employee, stating that there is a possibility of infection and also a possibility of error in the test. The patient is referred to the family physician, a letter containing the examination findings having been sent to the family physician. A confirmation test is recommended to be done by the private physician. If this is positive, the physician is asked to follow the treatment recommended by the U. S. Public Health Service. If results of the confirmation test are different from the first test, another specimen and test are taken.

The record is kept confidential and the employee is continued at work, unless his disease is infectious or there is a central nervous system or other manifestation which would make him dangerous to himself and others.

The most discouraging aspect is the follow-up with the family physician, because there is no direct control over the treatment.

In summary, it is stated that routine bloods should be taken on every examination and that the report should be confidential. The plant physician should not make the diagnosis. The employee should be assured of the confidential nature of the treatment and of the relationship, and he should also be assured of continuous work when the instructions are properly followed. Follow-up procedures constitute an important phase of the work, which at present is not functioning as smoothly as it should.

DR. MILLARD C. HANSON discussed "A Syphilis Control Program in an Industrial Center." This report had to deal with the progress of a program developed in the health department at Pittsburgh. Details will not necessarily be given, only the general principles.

The first big task is the education of the public relative to case-finding and consultation work. Standard laboratory work has been arranged through DR. KAHN. The industries use the health department for their serology tests.

A central diagnostic clinic has been created where the positives come for a special examination and additional serology and where final diagnosis is made.

Educational surveys help to promote follow-up through physicians and industrial groups. It was felt that the program is of value as followed in Pittsburgh.

DR. OTIS L. ANDERSON presented the subject "A Proposed Plan for the Control of Venereal Disease in Industry."

There is a distinct relationship between diseases and dollars and cents principles. Hence the interest of the employer in this kind of program. The smaller industries constitute 60% of the total and employ 40% of all workers —hence the competitive problem involved. Most of these, however, render only a traumatic service.

The Division of Industrial Hygiene of the National Institute of Health has collaborated with industrial groups and devised a preliminary program for state and local health departments in assisting industry. Since there are considerable variations in local facilities, the plan should be well understood by various agencies, such as medical societies, labor departments and manufacturing associations. The plan should obviously be developed on a community basis.

An educational program has been provided for employers. Tests are recommended for all applications and on other examinations. Confidential relationship is emphasized. Reference to private physicians is advised, and the exclusion of contagious and degenerative types. State departments should cooperate on the follow-up and with respect to treatment phases. Tests should be made on all types of examinations. The principle of a three-year negative is usually followed. Arrangements for mandatory treatment in order to continue jobs is a part of the program. There should be prompt follow-up between industrial and private physicians. In conclusion, DR. ANDERSON referred to the resolutions of a conference held at Atlanta, Georgia, in February, 1940.

DR. JAMES H. GORDON discussed "Serology and Syphilis Control in U. S. Army."

Venereal disease is still the greatest cause of days lost, and the second greatest cause for admission for sick reports, in the U. S. Army. Therefore, it is of grave concern.

Control measures have been worked out through long study, and are the usual public health measures. These are as follows: (1) selection deferment if positive; (2) education in sex hygiene and venereal disease; (3) case-finding of a rather simple type; (4) chemical prophylactic treatment required and also mechanical prophylactic treatment, but there is no penalty for infringement; (5) certain disciplinary measures are used in certain instances, including the loss of pay and the extension of time, court martial if found necessary, and disability not compensated; (6) physical and recreational program; (7) cooperative action with the Navy for reporting, and great increase of laboratory facilities since 1910.

In 1926 the Kahn test was begun under the supervision of Craig. In 1938 the Kahn test began to be used as a screen test.

In conclusion, a control plan has been in operation in the U. S. Army since 1912 and has resulted in the reduction of venereal disease to a greater extent than of any other disease, except typhoid. It is hoped later to be able to work out a practical method for the control of civilian sources of infection.

DR. HAROLD W. SMITH completed the morning session in presenting "Serology and Syphilis Control in the U. S. Navy."

Since the Navy has 150,000 civilian employees, the number of which is increasing daily, one appreciates the value of industrial medicine measures because of the exposure of these civilian employees to occupational hazards.

There has been little experience with respect to the effect of lues on industrial workers so far as the Navy is concerned, but the Navy will participate actively in a national program for prevention and control of syphilis in industry.

The control program has been long in effect in the Navy with regard to its own service men, and there has been the addition of new methods from time to time. Lues ranks first or second in the causes of the largest number of man-days lost and about sixth in morbidity. There is a rate of about 12.9 per 1000 for clinical cases, which shows a reduction of 54% since 1932.

All infectious cases are hospitalized and treated until non-infectious; such cases averaged 12 man-days lost for this purpose in 1939. There was a total cost of $108,000 for initial treatment in that year.

New recruits are now required to have a Kahn and Wassermann test, which if positive, causes the individual to be discharged, and the name is sent to the health department. Cases inside the service are treated, but the man loses his pay, and there are certain rules regarding pensions and other benefits.

Serological tests are done on all patients in the hospitals, on food handlers, and on special groups, from time to time, or on request. The Kahn test is universal and the antigen is manufactured at the Navy Medical School. Wassermanns are done on spinal fluids to about one in 10 or Kahns on bloods. All large ships perform their own tests and also large stations, at the rate of about 1000 a day.

Positives were found on 20,000 naval recruits on the initial examination—0.365%, of which 0.16% were false positives.

As to treatment, arsphenamine treatment was discontinued in 1937.

In conclusion, reduction in the past seven years has shown positive serology in 1933 to be 14.3% as compared with 6.4% in 1940.

DR. R. A. VONDERLEHR presented "Syphilis Control in Industry and National Defense."

Serological tests have been done on all selectees up to the present time, totalling 1,070,000. In discussing gross prevalence rates by states and corrected state rates, corrections were made for age, race and color. The rate for the entire country for colored population was 230 persons per 1000 and among whites, 40 per 1000. The state rates varied from a high of 380 per 1000 in Florida to 125 per 1000 in Illinois. These figures are based on examinations and serology tests. Comparison of figures shows only about one-tenth of clinical lues in existence at the present time as in 1918. For Neisser infections, about one-third as much clinically. The geographical distributions show that there is considerably less distribution of venereal disease above the Mason and Dixon line than below.

The progress in the larger industries has been excellent, but not so in the smaller groups, and it is in the latter where the greatest amount of gain can be made.

In answer to a question by CHAIRMAN WATSON as to what happens to untreated cases, the results of an organized study among untreated negroes in Macon County, Georgia, about 400 men being involved, were discussed. On these, serologic tests, careful history, and thorough examinations and periodic followup were done. Cooperative advisory groups have assisted a great deal in the work over the entire country. There has been a suggestion of the feasibility of an advisory group being formed for smaller industries.

In conclusion, it was stated that the country can count on the support of the U. S. Public Health Service in industrial defense work with regard to the control and prevention of venereal disease.

DR. JOHN SUNDWALL spoke briefly with regard to "Educational Aspects of Syphilis Control."

The University of Michigan began offering the present courses in the control of venereal disease in the academic year 1938-1939. Reference was made particularly to an article written by DR. KAHN in 1926 when important predictions were made with reference to venereal disease control. An outline of a course on venereal disease was given, which program of study was offered only to graduates of approved schools of medicine and for which satisfactory completion provides for the granting of a degree of Master of Science in Public Health, in conjunction with three months' practical experience in a public health agency where recognized programs of venereal disease control are being carried on.

DR. WALKER CLARKE spoke on "Social Hygiene and the Defense Industries."

Reference was made to progress in defense industries in 1917-18. The principles were similar in outline to our present activities, but there are greater advantages at present. The speaker offered mainly a discussion of the previous presentations.

Serologic tests are only the beginning in such programs. The diagnosis must be made and treatment must be instituted after the serologic tests are made. Treatment is continued for a year and then the patient is observed and rested before retreatment. The blood test is not the sole criterion of pathology.

Education relative to prophylaxis is really most important—it is paramount among industrial workers—industry has the right to expect such educational measures from the health authorities in the district.

Relative to prostitution, studies in various industries have been made—in one instance, the workers had to pass brothels on the way to the factory gates—such spots should be cleared by local health authorities. Infection in industrial workers is more disastrous than in military personnel.

The government could do more in assisting by putting through as good programs in the service groups, as are now put through in industrial programs, which have been demonstrated in this meeting.

DR. CLARENCE SELBY discussed "The Importance of Syphilis Control in Industry."

DR. SELBY was not convinced that lues as a disease is industrially significant. For example, in a group of 187,000 employees (taking into account disabilities of seven days and over) the rate was seven per 1000 for occupational disease and occupational injury and 90 per 1000 for nonoccupational disease and nonoccupational injury. Of this latter type, 2½ per 1000 were due to infectious and parasitic diseases which include lues. Incidentally, tuberculosis occurred at the rate of 0.7 per 1000. Serology is done in all injury cases in this group.

The incidence of positive serology was shown to be 30 per 1000 in this group, so that this does constitute a public health problem. It is this problem which the essayist believed necessitated the approval of the industrial health program, as previously outlined by DR. IRWIN. The confidential relationship was reemphasized.

Another important principle enunciated was that the program should be built as a permanent project and not merely for national defense. In conclusion, it was stated that the U. S. Public Health Service, the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, the American Social Hygiene Association, and the A.M.A. are among the agencies now creating an advisory group.

In reviewing the various presentations, discussion was offered by DRS. DON LOWE, REUBEN KAHN, CASSIUS WATSON, EDWARD HOLMBLAD, ELLIOTT, and M. M. SHAFER. The question of verification of false positives was again brought up and DR. KAHN said the clinician should make the decision—if the reaction is positive and he thinks it is doubtful, he should verify it. In answering a question by DR. WATSON as to whether routine verification tests in a hospital would be a good research project, it was stated that the test is not now suitable for routine. DR. HOLMBLAD was pleased to hear the emphasis of clinical judgment. Referring to treatment of early cases, DR. ELLIOTT stated that there were 300 in Detroit, 700 in Cleveland, 900 in Chicago, 200 in Indianapolis, among active primary and secondary cases. There is, therefore, an opportunity for such early treatment. DR. SHAFER commented that the health officer and the industrial surgeon should ask the cooperation of private physicians and see that it is given.

DR. CASSIUS WATSON, in closing the conference, stated that the question of therapy in industry is most important; one must avoid the antagonism of the industrial personnel and this is a most difficult task. The plan of the Mt. Sinai group seems to offer a rapid method for practical purposes. DR. WATSON agreed with DR. SELBY relative to the industrial significance of lues, but also further agreed that it was a real public health problem. It was thought that another meeting here a year hence would be advisable. Motion to this effect was made by DR. WATSON, seconded by DR. HARVEY BARTLE, and passed.

Industrial Health Practices

—Report of a Survey of 2,064 Industrial Establishments, Conducted by the N.A.M. Committee on Healthful Working Conditions—

AMERICA'S 17 million industrial workers lose an average of about nine and one-half days each per year as a result of illness and accidents. This amounts to about 160 million man-days a year. The value of the time lost in terms of industrial wages, is more than three-quarters of a billion dollars a year. This amount does not include such other costs incidental to occupational and non-occupational injuries and sickness as compensation, spoilage, employee replacement, etc.

Both industrial leaders and the medical profession for many years have sought to reduce the suffering and loss resulting from illness and accidents among industrial employees. Phenomenal progress has been made in accident prevention, while hundreds of companies have instituted health programs under the direction of competent doctors and nurses. The mortality rate of industrial workers, as reflected by statistics of more than 17 million industrial policyholders of the Metropolitan Life Insurance Company,[5] reached a new low point in 1939. During the decade preceding 1939 their average life span increased by 6.65 years and now equals that of the nation as a whole—62.43 years.

Nevertheless, further improvement can still be attained. A recent publication of the U. S. Public Health Service reveals the lag in the application of existing measures of control for recognized occupational hazards: "The control measures for 1,503,204 exposures were found to be as follows: 14.3% were provided with local exhaust ventilation. Wet methods in dusty trades were recorded for 3.4% of the exposures, enclosed processes for 3.2% and respiratory protective devices for 3.2%. The study did show that workers exposed to certain materials known to be very toxic were, in most instances, provided with control measures."[19]

Occupational diseases, however, are a relatively minor cause of absenteeism. A study by the American College of Surgeons[3] in 1936 revealed that for every day lost because of occupational disease, 59 days are lost due to industrial injury and 885 days due to non-industrial injury and illness. Increasing attention must therefore be given in industry to the hazards of everyday life, such as tuberculosis.

Despite great reductions in tuberculosis among industrial workers, the mortality rate from this disease remains greater among them than among any other employed group. The death rate from tuberculosis* for males between 15 and 64 years of age in the general population dropped from 99.1 in 1930 to 70.6 in 1938, while, during the same period, that of like-aged white male policyholders of the Metropolitan Life Insurance Company dropped from 100.3 to 61.3. The most recent table of death rates by type of employment was published by the National Tuberculosis Association in 1930:[14]

Professional men	26.2
Proprietors, managers and officials	43.2
Agricultural workers	46.5
Clerks and kindred workers	65.8
Skilled workers and foremen	72.1
Semi-skilled workers	102.1
Unskilled workers	184.9
All gainfully employed males	87.5

IN 1937 the National Association of Manufacturers gave concrete evidence of industry's increasing interest in its health problems by forming a Committee on Healthful Working Conditions. This Committee was composed of manufacturers and was guided in technical matters by an Advisory Committee of industrial physicians and hygienists. Since then it has been engaged in collecting and disseminating information on health and working conditions in industry in an effort to reduce the tremendous toll of time and money taken by illness and accidents.

As a part of this Committee's 1940 activities, it undertook to survey the extent and development of factory health programs among the Association's membership. This project had four major purposes:

1. To obtain specific information about the value of maintaining health programs—information which was not adequately available from previous studies made in this field.

2. To investigate prevailing policies in industry regarding physical examinations: the rate of rejection of applicants because of physical unfitness revealed by such examinations; the extent to which examinees are rated according to the physical demands of the job; and the degree to which physical examination records are kept confidential between doctor and examinee.

3. To determine the frequency of specified services of a medical, hygiene, and safety-insuring character in industrial health programs.

4. To ascertain the age of factory health programs and the influence of size and type of industry on the annual per capita costs of such services.

The survey has brought forth more representative facts on these subjects than have ever before been available. The questionnaire was sent to 4,500 companies. Of these companies, 1,500 replied. Their returns cover 2,064 plants employing 1,945,551 workers. Forty-seven states and all of the major industries are represented.

Because companies were specifically requested to submit returns for each of their operating plants, the total number of replies was greater than the actual number of companies represented. Consideration was given to, and, wherever significant, detailed analysis was made of the replies according to the type of organization represented. Some of the companies operated a single plant and

*Number of deaths from tuberculosis per 100,000 deaths.

were designated as "independent plants." Of the others which operated more than one plant, those which returned questionnaires for each unit were called "company plants," while those which sent in a single return for their entire organization were considered as "consolidated plants."

As the 2,064 establishments represented in the study did not all reply to every item on the questionnaire, the conclusions are based on a varying number of returns for each question.

The type and scope of medical service developed in a given company are necessarily dependent on the nature of work and number of personnel involved. Therefore, wherever this is significant, data were analyzed according to size and type of industry.

Up until recent years comparatively little attention has been given to the medical problems of industry by the management of the small plant of 500 employees or less, because of the meager funds at its disposal. However, recent indications imply that more and more executives of small companies are giving this matter increasing consideration, so that the grouping of plants according to number of employees in this report is significant as a guide to the status and trend of factory health programs among these plants. The magnitude of this group compels special attention to it in efforts to improve the health of the industrial worker. It comprises 98% of America's factories, and employs over 60% of the country's eight million factory workers.[15]

Throughout the study, wherever possible, pertinent comparisons with previous studies are presented in an attempt to determine the significant trends in the development of factory health programs.

Summary and Conclusions

ANALYSIS of the information provided by the representative 2,064 replies to the National Association of Manufacturers' survey on factory health programs revealed the following significant facts:

1. Health programs have proved their worth to the companies instituting them.

(*a*) An estimate on the basis of reductions in various health hazards reported in this survey revealed that a health program saves the average 500-employee plant $5,611 net per year.

(*b*) All but five of a total of 1,625 respondents considered their programs paying propositions.

(*c*) Over 90% of those replying indicated reductions in accident frequency, occupational disease, absenteeism, and compensation insurance premiums.

(*d*) Between 85% and 90% indicated reductions in labor turnover, in addition to 83% which reported a good effect on their labor relations.

(*e*) Specific percentage reductions as follows were reported:

Accident frequency	44.9%
Occupational disease	62.8%
Labor turnover	27.3%
Absenteeism	29.7%
Compensation insurance premium	28.8%

2. Most concerns use physical examinations as a means of determining proper placement of their employees but do not unwarrantedly discriminate against applicants on the basis of the results of these examinations.

(*a*) Only 4.4%, on the average, of those applying for jobs in 1,154 plants were rejected because of physical shortcomings disclosed during physical examinations.

(*b*) Eighty per cent of the 1,388 plants reporting their policy stated that they had some system of rating their examinees according to the physical demands of the job.

(*c*) All of the large organizations employing 20,000 men or over reported that physical examination records were kept confidential between doctor (or nurse) and examinee, as contrasted to 45% of the plants having less than 250 employees. This policy was in force in 41% of the 1,455 plants reporting.

3. Twenty-three specified items were listed as important components of a factory health program.

(*a*) In order of importance, proportions of the 2,064 plants in the survey reported specified services as follows:

Over 80%: Program of accident prevention. Exhaust ventilation for dust, fumes, or gas control. Plant housekeeping and sanitation program.

70-80%: Maintenance of a locker room. Rooms equipped for medical examinations and emergency treatment. Pre-employment physical examinations of factory employees by a doctor.

60-70%: Maintenance of a rest room. Records of all illnesses and absences.

50-60%: Fatigue prevention program, including refreshments available. Employee hospital insurance. Provision for recreational or athletic activities. Periodic check-up of illumination of work surfaces.

40-50%: Pre-employment physical examinations of office employees by a doctor. Workroom temperature supervision. Registered nurse in the plant at regular scheduled hours. Periodic check-up physical examinations of factory employees. Maintenance of a lunchroom.

30-40%: Health education of employees to prevent ordinary illnesses. Employee mutual benefit association. Doctor in the plant at regular scheduled hours. Fatigue prevention program, including regular rest periods. Fatigue prevention program, including posture chairs or aids.

20-30%: Periodic check-up physical examinations of office employees.

(*b*) During the past year the 23 features were instituted or extended in many of the plants covered in the survey; 12 features by 10% or more of the plants reporting them and 11 features by less than 10% of the plants reporting them.

4. The survey shows that factory health programs are becoming more widely accepted regardless of size and type of industry, while these factors do have a direct influence on the average annual per capita costs of such programs.

(*a*) Forty-three per cent of the plants reporting had established their health services during the past depression decade.

(*b*) Seventy per cent of the programs instituted within the past five years were in plants having less than 500 employees.

(*c*) An average per capita cost of $5.17 was reported for plant medical programs, $3.34 for safety programs, and $3.41 for industrial hygiene programs.

(*d*) The independent companies revealed a gradual decrease in the annual per capita cost of medical programs as the number of employees increased.

(*e*) Wide variations by industry were reported in the costs of all three phases of a health program, but they showed no significant correlation with the specific accident and disease hazards of the industries.

Value of a Factory Health Program

ONE of the purposes of the National Association of Manufacturers' Survey of Health Programs was to determine the attitudes of experienced companies toward such services. The questionnaire used in the survey asked this question: "Do you consider your health program (in-

cluding medical, safety and plant hygiene) a paying proposition?"

The question was answered by 1,625 companies, of which all but five said "yes."

The five "no's" were from "independent plants," varying in size from 46 to 900 employees. Analysis of these cases revealed that they were negative responses with reservations. Two of them said that they had relatively limited services, and raised the question as to whether these were worthwhile. One company had established its program within the past year and, therefore, had "not yet" had sufficient experience to come to any conclusion on this point. One company, although it reported that its program was not a paying proposition, indicated that reductions had been attained in accidents, occupational diseases, labor turnover, and absences. One company had no explanation for its negative reply.

REDUCTION in accidents was the benefit most frequently derived from the establishment of health and safety programs. Of the 1,388 companies reporting the effect of their programs on accident frequency, 97% indicated a reduction, while the average reduction in 626 companies which estimated reductions was 44.9%.

The greatest improvement reported after the introduction of health programs was in occupational diseases. An average reduction of 62.8% was noted in 172 companies. Of 806 companies replying, 92% stated that they had experienced reductions.

Other improvements in factory conditions were reported as follows:

	Number of Replies	Percentage of Replies Indicating Reductions
Compensation insurance premium	1,067	93%
Absenteeism	1,008	92%
Labor turnover	924	87%

Following is a table showing the number of companies estimating specific reductions and the percentages of reductions reported:

	Number of Replies	Average Per Cent Reduction Reported
Compensation insurance premium	454	28.8%
Absenteeism	234	29.7%
Labor turnover	186	27.3%

The relatively large number of quantitative reports on accident frequency reduction may be credited to safety programs having a well established position as part of factory routine for many years, and systems of keeping records having been developed as an integral part of them. Also, records are kept because of workmen's compensation payable after accidents. Accidents are easily recognized as such, and accurate tabulations can be made.

Occupational diseases are often not recognized as such until the establishment of a medical department and, therefore, no adequate records are available for a "before" and " after" comparison. This, in fact, is the chief difficulty encountered in an attempt to determine the reductions possible in these various conditions. No records are kept until after the introduction of a health service.

No accurate method is available for measuring the effect of health programs on absenteeism and labor turnover, since these conditions are affected by a great number of factors other than those with which health and safety programs deal.

Reductions in compensation insurance premiums, reported by 434 companies, were included only where definite percentage savings in premiums were given. Many additional plants reported on experience ratings under their state laws pointing to great improvements in their status due to the introduction of health programs.

Of the 1,554 plants reporting on the relation of health and safety programs to labor relations, 83% said that there had been an improvement after the services had been established.

That working conditions may play a greater part in good labor relations than is generally considered is illustrated by the following instances quoted from the National Association of Manufacturers' files:

"Just recently I made a check of all grievances covering a period of seven months (for a company employing 9,500 employees). By percentages, it breaks down as follows: Wages, 24%; hours, 8%; working conditions, 68%.

"For one week in February it was as follows: Wages, 9%; hours, 11%; working conditions, 80%."

And another:

"Of all cases presented (as grievances), 73% were with reference to working conditions and safety. These cases included general plant sanitation, heating and ventilation, washrooms, lockers, mechanical devices, fire prevention, waste elimination, recreation, housing, transportation and public relations. About five-sixths of these cases referred to the above-mentioned items, and one-sixth pertained to safety."

These statements came from companies in which at least average attention is paid to working conditions and they may well be typical of the attitude of the average worker to his surroundings.

ALTHOUGH there are no comparable surveys of the benefits of health and safety programs for industry as a whole, similar results have been reported on the basis of studies of single industries. For instance, in 1929 the National Metal Trades Association[12] made a small sampling of their industry and found reductions in accident frequency and compensation insurance which are essentially the same as those found in the same industries in the National Association of Manufacturers' study. The reductions reported for absenteeism, however, vary widely from the National Association of Manufacturers' reports, but the causes of absenteeism have already been described as not being entirely related to health. Comparatively average reductions from the two studies are as follows:

	Accident Frequency	Absenteeism	Compensation Insurance Premium
National Metal Trades Association	43.6%	50.6%	28.7%
National Association of Manufacturers:			
Metal products, miscellaneous	40.0%	26.6%	26.6%
Iron and steel, heavy	41.6%	31.2%	29.6%
Machinery and machine tools	44.6%	32.4%	29.4%

Physical Examination Policies

REJECTIONS of applicants for jobs because of shortcomings discovered through physical examinations have recently been held to be a significant cause of unemployment. The facts revealed by the National Association of Manufacturers' survey disprove this contention. The average rejection rate for the 1,154 plants replying to this question was only 4.4%. Moreover, when the very high and very low rejection rates were not considered, it was found that the most representative rejection rates fell between 2% and 3%.

Physical examinations are a protection to the worker as well as to the employer. They make certain that no employee is called upon to do work for which he is not physically suited; they often acquaint him with conditions which may be corrected with little difficulty, but which if left unchecked could develop to serious proportions; and they aid in reducing accidents and absenteeism, thus saving him wages and medical fees. In addition to the satisfaction of knowing that his employees are suitably placed at their work, the employer realizes that the physical examinations provide him with records which will be valuable in case of unjust compensation claims.

Such examinations are an accepted condition of employment in fields other than industry. In government service medical check-ups are required. Even in today's urgency of defense work the requirements are maintained. Many labor unions require physical examinations and make membership contingent upon the applicant meeting their standards.

In 1931, the National Industrial Conference Board pointed out the difficulties placed in the way of indiscriminate hiring of workers, regardless of physical shortcomings, by existing state laws. It said:

"Workmen's compensation laws and the rulings of industrial accident commissions sometimes operate to prevent the employment of workmen who are below the normal standard of physical fitness. In some states the responsibility for an accident increasing the disability of an already defective worker is placed by law in full on the last employer, although the first injury which caused the partial disability may have occurred in a previous employment or may even have existed since the worker's childhood. For example, in a case where the sight of one eye had been partially or wholly destroyed, an accident causing the loss of the remaining eye would result in total blindness, for which the last employer would have to pay full compensation under some laws. This would so increase the employer's liability that he could not justly be expected to employ a one-eyed person. Partially incapacitated workers are at times denied employment for this reason, although they may otherwise be capable of active service if properly placed and safeguarded. Until this injustice in the compensation law is remedied and provision made for the equitable distribution of the responsibility for permanent and total disability, such unfortunate workers will be greatly handicapped in obtaining satisfactory employment."[7]

Some states have attempted to remedy this injustice, but the situation remains essentially unchanged today.

IN PREVIOUS studies of the number of persons rejected for employment due to physical shortcomings, it was found that the majority of companies accepted at least 95 out of every 100 applicants presented for physical examination. Results of the National Association of Manufacturers' study, shown here in comparison with similar earlier studies, indicate that there has been no increase in the rate of rejections for physical unfitness, despite the greater number of applicants to choose from during recent years:

Percentage Rejected	N.I.C.B.-U.S. Lab. Dept. 1924[4]	1928[16]	N.I.C.B.-N.A.M. 1930[8]	1940
Number of replies	165	185	221	1,154
0-5%	55%	76%	60%	78%
6-10%	28%	7%	23%	15%
11-50%	17%	17%	17%	7%
	100%	100%	100%	100%

These figures also show that there has been a definite reduction in the number of plants having a rejection rate greater than 10%.

THE low average rejection rate of 4.4% of applicants for jobs would indicate that industrialists are attempting to find, whenever possible, suitable employment for those with physical defects. Most plants include more than one type of operation, varying in the physical demands made on the individual. Many companies have attempted to give consideration to these differences at the time of the pre-employment physical examination, and to place an applicant in the job for which his physical condition best suits him. A widely used classification system is one recommended by the American College of Surgeons[2] and by many industrial physicians:

Class A (or I)	Physically fit for any work.
Class B (or II)	Physically underdeveloped, or other correctable defect; otherwise fit for any work.
Class C (or III)	Fit only for certain employment when approved and supervised by the medical department.
Class D (or IV)	Unfit for any employment.

When the applicant's physical condition falls within Class C, he is considered in the light of the demands of the particular job. If the applicant's physical condition is Class B or better, there is no need to give him special attention because he meets the general requirement.

About 80% of the 1,388 establishments in the National Association of Manufacturers' survey indicated that pre-employment examinees are rated according to the demands of the job. Of the very small plants having under 250 employees, 73% replied that they used some rating system. As would be expected, larger companies, which, in general, offer a more diversified range of occupations, have adopted this policy to an even greater extent than have the smaller ones. The percentage of plants within each size group rating the physical findings of examinees according to the demands of the job was:

Number of Employees	Percentage of Plants Rating Employees
1- 249	73%
250- 499	83%
500- 749	81%
750- 999	84%
1,000- 1,999	84%
2,000- 4,999	88%
5,000- 9,999	93%
10,000-19,999	88%
20,000-and over	100%
Average	80%

SINCE the number of rejections for employment due to physical defects is dependent upon the physical requirements to be met, there exists some correlation between these two features. Study of the comparison indicates that there is an inverse correlation to some extent. In general, those companies which have accepted to the greatest degree the policy of classifying jobs have lower rejection rates than do those which have not.

LESS than one-half of 1,455 reporting plants stated that physical examination records were kept confidential between the doctor (or nurse) and employees. In many of the plants this may be ascribed to the widespread practice of having the medical department under the direct supervision of other than medical personnel. For example, the National Industrial Conference Board found in 1939[10] that only 54.5% of 301 establishments surveyed maintained a medical department which was supervised by a doctor or a nurse. The remainder had no regular department, or else one which was under the direction of a first-aid man or personnel manager, superintendent, or top executive. By and large it seems that the confidential status of medical records depends roughly on the degree to which medical personnel are charged with the responsibility of the medical department.

Another factor which influences this practice is the size of the company. In the small companies, where there may not be suitable space for records in the medical department, 75% of the plants reported that they are also available to the personnel department, general office, or other personnel. However, the National Association of Manufacturers' figures shown below indicate that as the size of the company grows and the medical department becomes better organized, there is a steadily increasing percentage of companies which provide for strict maintenance of the confidential relationship between doctor and employee.

Number of Employees	Percentage of Plants Maintaining Confidential Records
1- 249	25%
250- 499	41%
500- 749	48%
750- 999	53%
1,000- 1,999	50%
2,000- 4,999	56%
5,000- 9,999	65%
10,000-19,999	83%
20,000-and over	100%
Average	41%

Representative Features

ALL of the companies included in this report have some type of factory health program, incorporating at least three or four of the significant features included in the questionnaire as important components of a factory health program.

Of 23 items listed in the questionnaire, eight were reported in at least 50% of the smallest size group (1-249 employees), and in even greater proportions in larger plants. Since a majority of even those plants least active in this field maintain these features, they might well be considered as *minimum* components of a workable factory health program. Included in order of frequency they are:

	Percentage of All Plants Including Feature
Program of accident prevention	89%
Exhaust ventilation for dust, fumes or gas control	85%
Plant housekeeping and sanitation program	82%
Maintenance of a locker room	73%
Room(s) equipped for medical examination and emergency treatment.	73%
Pre-employment physical examinations of factory employees by a doctor	72%
Maintenance of a rest room	68%
Records of all illnesses and absences	61%

These, together with the following four others, may be considered the *average* components of a factory program since they were maintained by at least 50% of all the companies replying:

Fatigue prevention program, including refreshments available	56%
Employee hospital insurance	54%
Provision for recreational or athletic activities	52%
Periodic check-up of illumination of work surfaces	50%

Maintenance of a doctor or registered nurse in the plant at regular scheduled hours is the least frequently (13%) occurring feature in those plants having under 250 employees. As the number of employees increases, however, and the need and justification for professional medical services grow, more and more plants include these features. Outstanding in these services, and reported by over 90% of the plants, is the group having between 10,000 and 20,000 employees. For the survey as a whole, 32% maintained a doctor and 42% a registered nurse.

Only 21% of all the plants provided periodic check-up physical examinations of office employees. The remaining features which were maintained by less than half of the companies surveyed were:

	Percentage of All Plants Including Feature
Pre-employment physical examinations of office workers by a doctor	48%
Workroom temperature supervision	48%
Registered nurse in the plant at regular scheduled hours	42%
Periodic check-up physical examinations of factory workers	42%
Maintenance of a lunchroom	41%
Health education of employees to prevent ordinary illnesses	39%
Employee mutual benefit association	39%
Doctor in the plant at regular scheduled hours	32%
Fatigue prevention program, including posture chairs or aids	32%
Fatigue prevention program, including regular rest periods	31%
Periodic check-up physical examinations of office employees	21%

AN ATTEMPT was also made to determine what features had been introduced or extended during the past year. The proportion of plants which instituted or extended specific features during the year was as follows:

	Percentage of All Plants Including Feature
Employee hospital insurance	26%
Periodic check-up physical examinations of factory employees	21%
Doctor in the plant at scheduled hours	14%
Exhaust ventilation for dust, fumes or gas control	14%
Periodic check-up physical examinations of office employees	13%
Pre-employment physical examinations of factory employees by a doctor	12%
Fatigue prevention program, including refreshments available	12%
Room(s) equipped for medical examinations and emergency treatment	11%
Provision for recreational or athletic activities	11%
Pre-employment physical examinations of office employees by a doctor	10%
Periodic check-up of illumination of work surfaces	10%
Plant housekeeping and sanitation program	10%
Records of all illnesses and absences	9%
Program of accident prevention	9%
Maintenance of a lunchroom	9%
Health education of employees to prevent ordinary illnesses	9%
Maintenance of a locker room	8%
Fatigue prevention program, including regular rest periods	8%
Registered nurse in the plant at regular scheduled hours	7%
Employee mutual benefit association	7%
Fatigue prevention program, including posture chairs or aids	7%
Workroom temperature supervision	6%
Maintenance of a rest room	4%

The two features showing the greatest growth were employee hospital insurance (26%) and periodic physical examinations of factory workers (21%). The striking spread of community hospitalization plans is probably a large factor in the expansion of employee hospital insurance, but the reasons for the increase in the periodic physical examinations of factory workers are not so evident. Employers have probably been convinced of the value of periodic check-ups in catching disability at its inception by the educational efforts of insurance companies and health associations, as well as by the disclosures of occupational disease studies. Whatever the exact cause, this development is a significant indication of the change from thinking of industrial medical service solely as a curative program to the present growing emphasis on its preventive aspects.

THE National Association of Manufacturers' survey of industrial health features corroborates similar information from earlier studies. For example, the National Industrial Conference Board's study[11] in 1939 shows general agreement with the National Association of Manufacturers' study in the relative importance, according to the frequency of replies, of specified services:

	N.A.M.-1940	N.I.C.B.-1939
Sanitation	82%	95.7%
Pre-employment physical examinations	72%	84.4%
Periodic physical examinations	42%	70.8%
Health education	39%	59.8%

The National Industrial Conference Board's study included 301 plants having 621,041 employees whereas the National Association of Manufacturers' survey reported on 2,064 plants covering 1,945,551 employees. Moreover, 40% of the plants in the National Association of Manufacturers' survey employed less than 250 workers, whereas, 12.6% of the plants in the National Industrial Conference Board's study fell in this group. Eighty

per cent of the plants in the National Association of Manufacturers' survey employed less than 1,000 workers, compared to 64.8% in the National Industrial Conference Board's study. The higher proportion of small plants in the National Association of Manufacturers' study is reflected in the lower incidence of replies reported for each item.

A study conducted by the National Safety Council[13] in 1938 also compares with the National Association of Manufacturers' study in the relative importance of specified features of a health program. Here again, the actual percentages of plants having these features are lower in the National Association of Manufacturers' survey, probably because the National Safety Council's figures are representative of many more large companies. They included 213 companies, only 21.1% of which employed 500 or less workers.

	N.A.M.-1940	N.S.C.-1938
Maintenance of a locker room	73%	89.2%
Pre-employment physical examinations by a doctor of factory employees	72%	86.9%
Maintenance of a rest room	68%	48.8%
Periodic check-up physical examinations of factory employees	42%	36.6%
Registered nurse in the plant at regular scheduled hours	42%	91.1%
Maintenance of a lunchroom	41%	87.8%
Doctor in the plant at regular scheduled hours	32%	95.5%

The greater proportion of doctors and nurses found in the National Safety Council's study is not surprising since it was limited to plants which had organized medical departments and which, therefore, would require at least part-time doctors or nurses in attendance.

A study of physical examinations in 925 plants made by the American College of Surgeons in 1932,[1] discloses very close agreement with the National Association of Manufacturers' survey. Once more, the latter study is influenced by the higher proportion of small companies which it contains (62% under 500 workers and 80% under 1,000, compared to 21% and 47% respectively in the American College of Surgeons' study). Pre-employment and periodic physical examinations apparently have maintained the same relative importance in the industrial medical program, at the same time that more factories have initiated these features as parts of their programs.

	N.A.M.-1940	A.C.S.-1932
Pre-employment physical examinations	72%	65%
Periodic physical examinations	42%	28%

This bears out the statement, made by the American College of Surgeons in 1938 when issuing the above report,[1] that "The percentage of establishments in all sized groups giving physical examinations to employees has subsequently been materially increased on account of the occupational disease situation."

Age and Cost of Health Programs

INDUSTRY'S appreciation of the value of health programs is indicated by the extent to which such programs have been introduced during the past decade of general business retrenchment. Forty-three per cent of the plants reporting had established their health services within the last 10 years. During the depression which followed the World War many of the newly-formed medical departments were completely abandoned. However, after such services had been given an opportunity to prove their worth during the years of prosperity which followed, this was not repeated during the recent depression. Medical departments suffered a decrease in size and budget commensurate with lessened employment and production, but only rarely were they abolished.

Seventeen per cent of the companies replying had programs which had been inaugurated over 20 years ago. Analysis shows these to be largely companies in the higher size brackets, or "company plants" in the smaller size brackets. This is as would be expected from "company plants" for they share in the benefits of organization and financing introduced by their parent companies.

An additional 17% of the replying plants indicated that their programs had been in effect "several years," "a long time," or "since the establishment of the company." In the case of a large company such a remark might well mean 15 to 20 years, while a smaller company might make the same statement for only a relatively few years. In many other cases it was remarked that successive features of the program had been introduced over a period of years.

That 70% of the programs instituted within the past five years were within plants having less than 500 employees shows that small companies are learning the value of health and hygiene preventive measures and are eager to introduce such features. The distribution of plants according to length of time medical programs had been in effect was as follows:

Number of Employees	1-5 Years	6-15 Years	16 Years and Over	Miscellaneous	Total
	(Per cent of total)				
1- 499	70	57	41	50	55
500-1,999	25	34	37	35	32
2,000-and over	5	9	22	15	13
Total ...	100	100	100	100	100

	N.A.M.-1940	P.H.S.-1934[18]
Percentage of plants having:		
Under 250 employees	40%	.....
Under 100 employees	....	89.8%

	Percentage of 250-Man Plants Having Specified Service	Percentage of Total Plants Having Specified Service*
Rooms equipped for medical examinations and/or first-aid treatment	51%	9.8%
Record(s) of illnesses and absences	50%	16.8%
Employee mutual benefit association	22%	6.8%
Doctor in the plant at regular scheduled hours	13%	4.4%
Registered nurse in the plant at regular scheduled hours	13%	4.1%

*Includes 90% having under 100 employees and 10% having between 100 and 1,000 employees.

Further corroboration of this growth is provided by a comparison with a United States Public Health Service study[17] of 28,686 workers in 615 plants, of which 89.8% employed less than 100 men.

Although the studies are not strictly comparable because of differences in distribution by size of returns, the increase in the maintenance of various medical features is apparent throughout the comparison. Many more plants in the later survey were found to have each of the services listed. The differences in the results between the two surveys are sufficiently great to indicate a significant growth during the intervening time in the number of small companies providing these medical services for their employees.

THE annual per capita expenditure for industrial medical services has risen considerably during the past 25 years, although the rise has been slight since 1924. This growth has been measured at varying intervals by several surveys, the results of which are as follows:

Year	Annual Per Capita Cost Industrial Medical Services*
1915	$0.88
1917	2.21
1921	4.43
1924	5.14
1930	5.10
1932	6.30
1936	5.10
1938	6.12
1940	5.17

The American College of Surgeons explains the high per capita cost in 1932 as follows:

"The greater per capita cost in 1932 is partially explained by the fact that medical service, although reduced, was not curtailed as rapidly or as much as was employment during the depression period. Consequently the medical costs were spread over comparatively fewer employees. Furthermore, the recent marked increase in number of workers in industry also accounts for the apparent reduction in per capita cost in 1936 when in reality the total medical cost will be considerably greater in 1936 than in 1932."*

This explanation applies to the recession year of 1938 as well, but in a lesser degree.

Analysis of the average per capita costs of the three main features of a health program reveals great variations:

Type of Program	Number of Returns	Average Per Capita Cost
Companies Reporting Separate Costs:		
Medical	688	$5.17
Safety	494	3.34
Industrial Hygiene	159	3.41
Companies Reporting Combined Costs:		
Medical and Safety	21	5.97
Medical and Industrial Hygiene	57	4.90
Safety and Industrial Hygiene	12	5.51
Medical, Safety and Industrial Hygiene	142	8.81

For example, on the basis of costs reported separately, a complete health program would cost, theoretically, an average of $11.92, whereas the average combined cost reported was only $8.81. Discrepancy is to be expected since the bookkeeping systems of many companies do not separate the costs of a health program, or of any of its components, from the general costs of running the business, and the figures in many cases had to be rough estimates on the part of the respondents.

In general it was found that, for all phases of the health program, the per capita cost was greater to the independent plants than to the companies with several plants.

Type of Plant	Medical Program	Safety	Industrial Hygiene
Company and Consolidated	$5.06	$2.97	$2.55
Independent	5.26	3.67	3.99
Average	$5.17	$3.34	$3.41

IN the case of the independent plants, which are the only ones in this survey truly representative of the effect of size on the cost of the program, the *medical* costs, with some exceptions, show a gradual decrease as the number of employees increases. The safety and industrial hygiene costs do not show any similar correlation.

DISTRIBUTION OF AVERAGE ANNUAL PER CAPITA COSTS OF SPECIFIED FACTORY HEALTH PROGRAMS, ACCORDING TO MAJOR INDUSTRIAL CLASSIFICATION

Industry	Medical Program			Safety Program			Industrial Hygiene Program		
	Replies	Average Per Capita Cost	Ratio to Average for All Industries	Replies	Average Per Capita Cost	Ratio to Average for All Industries	Replies	Average Per Capita Cost	Ratio to Average for All Industries
Chemicals and their products	45	$5.42	1.05	32	$3.21	.96	7	$5.33	1.56
Electrical products	23	4.95	.96	18	1.84	.55	9	1.98	.58
Food and kindred products	124	2.97	.57	38	2.54	.76	28	1.62	.48
Iron and steel, heavy	65	4.51	.87	55	4.69	1.40	13	6.15	1.80
Leather and its products	4	4.80	.93	4	4.57	1.37	..	...	...
Lumber and its products	19	10.29	1.99	19	3.42	1.02	4	2.09	.61
Machinery and machine tools	98	5.35	1.03	79	2.84	.85	29	3.88	1.14
Metal products, miscellaneous	126	6.38	1.23	105	2.84	.85	17	2.92	.86
Mining and quarrying	6	12.26	2.37	7	5.27	1.58	3	5.39	1.58
Paper and its products	37	6.05	1.17	33	3.73	1.12	8	3.56	1.04
Petroleum refining	15	6.58	1.27	15	7.87	2.36	2	5.00	1.47
Printing and publishing	8	2.33	.45	6	1.48	.44	2	.85	.54
Public utilities	5	4.83	.93	4	2.56	.77	..	...	...
Rubber and its products	28	5.51	1.07	13	1.40	.42	10	1.30	.38
Shipbuilding and other construction	4	3.08	.60	5	11.83	3.54	2	6.34	1.86
Stone, clay and glass products	33	4.94	.96	34	3.72	1.11	16	1.90	.56
Textiles and their products	40	4.60	.89	22	1.64	.49	12	6.77	1.99
Unclassified	8	4.02	.78	5	3.13	.94	2	2.96	.87
TOTAL, ALL INDUSTRIES	688	$5.17	1.00	494	$3.34	1.00	159	$3.41	1.00

DISTRIBUTION OF REPLIES INDICATING INSTITUTION OR EXTENSION OF SPECIFIED FEATURES OF A FACTORY HEALTH PROGRAM WITHIN THE PAST YEAR

FEATURE	NUMBER OF REPLIES			Per Cent of Total Having These Features
	Instituted	Extended	Total	
Rooms(s) equipped for medical examination and emergency treatment	19	147	166	11
Pre-employment physical examinations of office employees by a doctor	60	34	94	10
Pre-employment physical examinations of factory employees by a doctor	69	112	181	12
Periodic check-up physical examinations of office employees	25	29	54	13
Periodic check-up physical examinations of factory employees	84	97	181	21
Doctor in the plant at regular scheduled hours	19	71	90	14
Registered nurse in the plant at regular scheduled hours	17	42	57	7
Health education of employees to prevent ordinary illnesses	22	43	65	8
Records of all illnesses and absences	48	65	113	9
Employee mutual benefit association	14	44	58	7
Employee hospital insurance	205	88	293	26
Program of accident prevention	36	131	167	9
Periodic check-up of illumination of work surfaces	31	58	99	10
Workroom temperature supervision	14	45	59	6
Exhaust ventilation for dust, fumes or gas control	31	217	248	14
Plant housekeeping and sanitation program	29	144	173	10
Maintenance of a restroom	9	52	61	4
Maintenance of a lunchroom	18	54	72	9
Maintenance of a locker room	23	104	127	8
Provision for recreational or athletic activities	34	80	114	11
Fatigue prevention program, including regular rest or relief periods	16	33	49	8
Fatigue prevention program, including posture chairs or aids	8	36	44	7
Fatigue prevention program, including refreshments available	51	91	142	12

Following is a summary of the returns by sizes of plants:

NUMBER OF EMPLOYEES	MEDICAL		SAFETY		INDUSTRIAL HYGIENE	
	Number of Replies	Average Costs	Number of Replies	Average Costs	Number of Replies	Average Costs
1- 249 ...	99	$5.06	83	$4.30	32	$3.49
250- 499 ...	92	5.70	71	2.74	27	3.98
500- 749 ...	39	5.93	31	3.63	11	4.96
750- 999 ...	36	5.80	20	3.71	10	2.17
1,000- 1,999 ...	46	4.50	30	4.06	5	9.63
2,000- 4,999 ...	26	4.59	19	3.57	6	3.22
5,000- 9,999 ...	3	3.02	2	3.63	1	3.20
10,000-19,999 ...	4	3.47	1	7.00	2	5.21
20,000 and over.	1	7.00	1	4.00	1	3.00
Average Costs		$5.26		$3.67		$3.99
Total Replies .	346		258		95	

A BREAKDOWN of costs by industries shows a wide variation. Medical costs range from $2.33 to $12.26; safety costs from $1.40 to $11.83; and industrial hygiene costs from $1.30 to $6.77. Following are the figures for the industries represented:

Industry	Medical	Safety	Industrial Hygiene
Mining and quarrying	$12.26	$5.27	$5.39
Lumber and its products	10.29	3.42	2.09
Petroleum refining	6.58	7.87	5.00
Metal products, miscellaneous	6.38	2.84	2.92
Paper and its products	6.05	3.73	3.56
Rubber and its products	5.51	1.40	1.30
Chemicals and their products	5.42	3.21	5.33
Machinery and machine tools	5.35	2.84	3.88
Electrical products	4.95	1.84	1.98
Stone, clay and glass products	4.94	3.72	1.90
Public utilities	4.83	2.56	....
Leather and its products	4.80	4.57	....
Textiles and their products	4.60	1.64	6.77
Iron and steel, heavy	4.51	4.69	6.15
Unclassified	4.02	3.13	2.96
Shipbuilding and other construction	3.08	11.83	6.34
Food and kindred products	2.97	2.54	1.62
Printing and publishing	2.33	1.48	0.85

The hazardous or non-hazardous nature of occupations involved is not the sole determinant of the per capita cost of a company's health program. Individual factors, such as the extent of preventive services provided, size and location of plant, type of organization of company, all affect the amount of money which is spent on health work.

ACCORDING to the National Association of Manufacturers' study, the estimated cost of a health program for a 500-man plant is $13.46 per employee per year, or a total of $6,730. An estimate of savings and losses to industry in proportion to the extent of medical programs, made by the U. S. Public Health Service,[20] revealed 1½ times the average daily wage as the annual potential loss to the employer on account of absenteeism. Reductions of 47% in accident and occupational diseases, and 28% in absences, as reported for the average 500-man plant in the National Association of Manufacturers' study, would, on this basis, result in a saving to the company of $12,341 per year, assuming an average daily wage of $5. A deduction of $6,730 for medical costs leaves a net saving to the company of $5,611 per year, while the saving in wages to the employees amounts to $6,300, on the following basis (all statements pertaining to the average factory of 500 employees):

OCCUPATIONAL DISEASE AND ACCIDENTS

ONE compensation case per 20 employees per year = 25 compensable accidents per year.

Twenty-five accidents x $246 (average total direct cost of a compensation accident[1]) = $ 6,150.00
loss to compensable accidents.

NON-INDUSTRIAL ACCIDENTS AND SICKNESS

NINE days absence per employee per year x 500 employees[2] = 4,500 days lost per year.

$5 average daily wage x 4,500 days lost = $22,500 pay loss to employees each year.

4,500 x $7.50 (estimated cost to company of a day's absence is 1½ times daily wage[3]) = 33,750.00
loss to company each year due to other absences.

Total annual loss to company = $39,900.00

1. HEINRICH: *Monthly Labor Review*, November, 1930.
2. NEWQUIST: Medical Service in Industry and Workmen's Compensation Laws, 1938, American College of Surgeons.
3. BRUNDAGE: Public Health Reports, August 21, 1936.

ANNUAL COST OF HEALTH AND ACCIDENT PROGRAM

$13.46 (cost per employee per year) x 500 = $ 6,730.00 per year.

RESULTS OF HEALTH AND ACCIDENT PROGRAM

AVERAGE reduction in accidents and occupational disease = 47%.

47% x $6,150 (cost of compensation cases per year) = 2,891.00
saving to company each year from reductions in accidents and occupational disease.

Average reduction in absences = 28%.

28% x 4,500 (average number of days lost per year due to non-industrial illness and injury) = 1,260.

1,260 x $5 (average daily wage) = $6,300 saved to men.

1,260 x $7.50 (loss to company is 1½ x daily wage) = 9,450.00
saving to company each year from reduction in absences.

Saving to company per year = 12,341.00
Cost of health and safety program per year = 6,730.00

Net profit to company per year = 5,611.00
Plus 24.5% reduction in labor turnover, and 26.4% reduction in compensation insurance premiums.

References:

1. American College of Surgeons, "Medical Service in Industry and Workmen's Compensation Laws," 1938, p. 16.
2. *Ibid.*, p. 18. 3. *Ibid.*, p. 33. 4. *Ibid.*, p. 34.
5. Metropolitan Life Insurance Company, Statistical Bulletin, January, 1940, pp. 1-2.
6. National Industrial Conference Board, Inc., "Medical Care of Industrial Workers," 1926, p. 32.
7. National Industrial Conference Board, Inc., "Medical Supervision and Service in Industry," 1931, p. 32.
8. *Ibid.*, p. 34.
9. National Industrial Conference Board, Inc., Studies in Personnel Policy No. 17, "Medical and Health Programs in Industry," 1939, p. 6.
10. *Ibid.*, p. 11. 11. *Ibid.*, pp. 12, 15, 16.
12. National Metal Trades Association, Committee on Industrial Relations, "Employee Medical Service," 1929.
13. National Safety Council, Inc., Health Practices Pamphlet No. 5, "Health Service in Industry," 1939, p. 9.
14. National Tuberculosis Association, "Death Rates by Occupation," 1930, p. 32.
15. U. S. Bureau of the Census, "Biennial Census of Manufacturers, 1937."
16. U. S. Department of Labor, Bulletin of the U. S. Bureau of Labor Statistics No. 458, "Health and Recreation Activities in Industrial Establishments, 1926-1928."
17. U. S. Public Health Service, Public Health Bulletin No. 216, "The Potential Problems of Industrial Hygiene in a Typical Industrial Area in the United States," 1934.
18. *Ibid.*, pp. 8-9.
19. U. S. Public Health Service, Public Health Bulletin No. 259, "A Preliminary Survey of the Industrial Hygiene Problem in the United States," 1940, p. 80.
20. U. S. Public Health Service, Public Health Reports, August 21, 1936, "An Estimate of the Monetary Value to Industry of Plant Medical and Safety Services," p. 1151.

Course in Industrial Health

THE UNIVERSITY OF CHICAGO, through the Department of Nursing Education, is offering a course in Industrial Health to public health nurses. It will include a study of the origin and development of industrial health programs and present-day objectives, organization, and activities. Special emphasis will be given to the role of the nurse. Numerous experts in the field of industrial health will participate in the course.

PREREQUISITES: Eligibility for admission to the University of Chicago and either experience or special preparation in public health nursing.

The course is offered through University College, at 18 South Michigan Avenue, during the Autumn and Winter Quarters, 1941-42, on Wednesday evenings from 7:50 to 9:30.

Industrial Health

THIS course is offered to help meet the emergency situation which now exists because of the National Defense Program. It is open to graduate nurses who meet university entrance requirements and who have had either experience or special preparation in public health nursing.

One Course, extending through Autumn and Winter Quarters, 1941-42. University College, Wednesday evenings from 7:50 to 9:30.

OBJECTIVES—To help students:

1. Gain an understanding of the important factors which have played a part in the development of present-day health programs in industry.
2. Gain an understanding of the organization and administration of the health programs within the industry.
3. Become acquainted with health hazards in industry and methods of their prevention and treatment.
4. Gain an understanding of the essential elements of a health program in industry and of the role of the nurse within the program.
5. Gain an understanding of the desirable qualifications for the health personnel in an industrial health program.

OUTLINE OF SUGGESTED CONTENT:

I. Historical Survey of the development of health programs in industry.
II. Organization and Administration of the health program in industry.
  A. Types of organization and administration.
  B. Personnel.
  C. Relationships with:
    1. Management and other departments within industry.
    2. Workers, associations, clubs, etc.
    3. Community.
    4. Federal, state, local agencies.
III. The Physician and the Health Program:
  A. Remedial and rehabilitation activities:
    1. Accidents and non-occupational disabilities.
    2. Recognition and control of occupational diseases. The industrial problems related to dust, solvents, heavy metals, etc.)
  B. Health supervision and education, including the health examination.
  C. Principles of industrial hygiene with relation to general problems of adult hygiene, including:
    1. Communicable diseases; tuberculosis, syphilis, etc.
    2. Mental hygiene.
    3. Nutrition.
    4. Housing.
IV. End of First Term and Examination.
V. The Industrial Hygiene Engineer:
  A. Engineering control of occupational diseases.
  B. Plant sanitation.
VI. The Safety Engineer:
  A. Accident records and statistics.
  B. Control of occupational accidents.
VII. The nurse and the Health Program and her functions in regard to:
  A. Health examination.
  B. Occupational disease.
  C. Communicable disease and other illness.
  D. Occupational accidents.
  E. Mental hygiene aspects.
  F. Plant sanitation and housekeeping.

G. Health education.
H. Records and statistics.
VIII. Preparation and qualifications of the public health nurse in industry.
IX. Final examination.

National Defense

—and Occupational Disease—

WILLIAM B. FULTON, M.D., M.P.H., F.A.P.H.A.,
Director, Bureau of Industrial Hygiene,
Pennsylvania Department of Health,
Harrisburg, Pennsylvania

IN THESE troubled times, conservation of health has become more important than ever before. Good health is not only an essential requirement for young men in our rapidly growing armed forces, but also a necessity for all others, men and women, who are playing their parts in the industrial phase of our national defense program. Protection of health is vital to national service as well as an important factor in economics and an expression of humanitarianism.

Any program for defense entails the fullest possible mobilization of the nation's energies, and to this the newer knowledge of industrial health is importantly contributing. This knowledge has been obtained as a result of the development of industrial hygiene activities in this country which is said to have begun with the enactment of the first child labor law in Pennsylvania in 1848.

The most recent impetus in this movement was brought about by the enactment of the Federal Social Security Act of 1935. Under the provisions of this act, funds were made available to the states for expansion of their public health facilities. In this country at the present time, 31 states have organized divisions of industrial hygiene in their state departments of health, while in two other states, New York and Massachusetts, industrial hygiene activity is a function of their labor departments. The National Institute of Health of the United States Public Health Service has a Division of Industrial Hygiene, the United States Bureau of Mines, through its health and safety division, and the Division of Labor Standards of the United States Department of Labor, comprise those Federal agencies concerned with the health of workers in industry. Some of the non-official agencies which have been making important advances in this field include insurance companies, universities, the Air Hygiene Foundation of America (now Industrial Hygiene Foundation of America), the American Medical Association through its state and county medical societies and other professional societies, and some of the larger plants.

A division of Industrial Hygiene in Pennsylvania had its origin in the Department of Labor and Industry in the early 1920's, at which time a physician was transferred from another activity to devote full time to industrial hygiene. Later a chemist was assigned to assist this physician. In 1934 the division was reorganized, and in 1936 it was transferred to the Department of Health. Increased industrial activity, because of the present national emergency, has necessitated the establishment of four new district offices in the Bureau of Industrial Hygiene in cities located convenient to the larger industrial areas of the state; namely, Erie, Altoona, Williamsport and Scranton. These offices were an addition to the already established offices and laboratories located in Harrisburg, Philadelphia and Pittsburgh. Additional technical and non-technical personnel have been added to the Bureau's staff and are given "in-service" orientation instruction and training. The personnel of the Bureau includes physicians, engineers, chemists, bacteriologists, physicists and technicians, all with specialized training in industrial hygiene. Recently Dr. Shaw has authorized the creation of a physical education division in the Bureau which will stimulate the organization of recreational activities among employee groups, especially, at this time in the national defense plants. The non-technical personnel includes a new group of persons classified as industrial sanitarians. These industrial sanitarians are now performing non-technical duties which had previously been a necessary part of the work of the industrial hygiene engineers. The transfer of these duties has enabled the engineers to devote more time to the investigation and control of specific health hazards in industry. Because of the expansion which had been planned prior to the present national defense emergency to meet the normal needs of industry, the development and organization of a plan to provide industrial hygiene services to plants in Pennsylvania having war contracts was effected with a minimum amount of delay.

In addition to the conditions which influence the health of many industrial workers as a result of their specific occupational exposures, it is well recognized that the worker is also affected by other factors which cannot be attributed to his employment. These include many conditions which may affect the health of the general population, such as infected food and water supply, inadequate housing facilities, venereal diseases, lack of adequate medical care, etc.

In planning a program, we recognized the need of adopting methods that would enable us to visit a large number of plants in a relatively short period of time for the purposes of education, advice on specific problems, appraisal of general health conditions of plant and community, and making those parts of the data collected relating to other phases of the public health problem available to the proper governmental agency.

The names of the plants selected for interview were obtained from weekly lists furnished by the Division of Public Contracts, United States Department of Labor, through arrangements which had been made by the Division of Industrial Hygiene of the National Institute of Health. The

Subject matter of the presentation by DR. FULTON at the Second Annual Meeting of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, Pittsburgh, May 5-9, 1941.

plants listed in these weekly bulletins include only those coming under the requirements of the Walsh-Healy Act, which, as you know, does not concern itself with governmental contracts less than $10,000 in value. In the period, July 1, 1940, to May 15, 1941, a total of 2,367 Walsh-Healy defense contracts were awarded to 917 Pennsylvania plants. The total value of these contracts under which materials and equipment were furnished to the Army, Navy, Air Corps and Panama Canal Defense projects was approximately $360,000,000. This figure is not a true index of the amount of funds spent in Pennsylvania for defense contracts because it does not include the Philadelphia Navy Yard's contracts for shipbuilding, contracts for construction and enlargement of army camps, sub-contracts and those contracts less than $10,000 in value.

FOR the period July 1, 1940, to May 15, 1941, approximately 1,850 visits were made by our personnel to plants having war contracts for the purpose of acquainting them with the facilities of the Bureau, providing assistance in specific health problems, and appraising the extent of health facilities existing in the plant and the community. These data have been tabulated and the results are available from 827 plants employing approximately 408,000 persons.

Information obtained in general included number and description of employees, source of labor supply, housing facilities, water supply, sewage disposal, industrial waste disposal, plant welfare activities, plant medical services, plant sanitation, venereal disease control measures and specific occupational health problems. This information was obtained in an interview with a responsible plant official. During the interview and an inspection of the plant, our engineers, in many instances, were able to make recommendations for the control of obvious health hazards. As a result of these interviews and plant inspections, requests are being received for revisits to particular plants to assist in the control of additional hazards and make more detailed studies of specific problems.

As mentioned earlier, the data collected are being made available to other governmental agencies; for example, the State Bureau of Vocational Rehabilitation has been furnished with the names of plants which will employ physically handicapped persons together with the type of handicap which is not a bar to employment in each particular plant. The director of this Bureau, Mr. M. M. Walter, reports that his Bureau has been able to place many physically handicapped persons in some of the 223, or 27%, of the plants that had indicated they would employ persons with physical handicaps of one type or another. Physical disabilities which were not considered a bar to employment in these plants included loss of finger or fingers, loss of one eye, loss of one leg, loss of one hand or one arm, and many others too numerous to mention in this report.

Of an estimated 3,700,000 gainfully employed workers in Pennsylvania, 48% are engaged in the manufacturing, mechanical and mineral industries. In 1937 more than 17,000 manufacturing plants were included in the Industrial Census. The percentage distribution of the plants according to the number of employees shows that 39.8% employed 100 or less. A classification of 827 defense plants having contracts of $10,000 or more showed that 2% employed less than five, and 43% employed 100 or less. The reasons for this difference are obvious.

SOME estimate can be made of industrial expansion resulting from the present emergency by the fact that these 827 plants with a normal employee population of 323,088 have already employed approximately 85,395 new employees which is a 20.8% increase. Six hundred thirty-nine of the 827 plants surveyed will employ additional personnel when operating at maximum production. Of this number, 565 reported that they would need an estimated 90,334 persons. Seventy-four plants were unable to determine how many new employees they would need. One hundred eighty-eight plants reported that no increase in their personnel was anticipated. This increase in the number of new employees, in practically all cases, has been supplied by local residents and persons living within commuting distance from the particular plant.

Our investigation to date has shown that housing facilities may become acute in many communities in the state if plants in these communities are unable to obtain additional employees who are local residents or within commuting distance. The names of the cities or the areas in the state where adequate housing facilities are not available have been brought to the attention of the Pennsylvania State Housing Authorities.

An appraisal of the water supply and sewage disposal facilities showed in general that they were adequate in practically all of the plants because of the fact that these plants are located in urban communities, which, in this case, are defined as communities having either public water supply or sewage disposal systems. An appraisal of the private water supply, sewage and industrial waste disposal systems to determine such factors as the potability of drinking water, existence of cross connections and the method of disposal of sewage and industrial waste has been made jointly by our engineers and those of the Bureau of Sanitary Engineering. Recommendations have been made for the correction of any condition found which was contrary to the sanitary regulations of the Department of Health.

A determination of the number of workers to whom plant welfare activities, medical and nursing services and adequate plant sanitary facilities are available showed that 32, or 4%, of the plants (132,237, or 32%, of the workers) have the services of a full-time plant physician. One hundred fifty-four, or 19%, of the plants (140,902, or 35%, of the employees) have the services of a part-time plant physician. Full-time safety engineers are employed in 139, or 17%, of the plants and are

available to 247,366, or 61%, of the employees. One hundred fifty-one, or 18%, of the plants (71,317, or 17%, of the employees) have the services of a part-time safety engineer. Full-time nursing service is available in 122, or 15%, of the plants and available to 263,294, or 64%, of the employees. Twenty-nine, or 4%, of the plants (12,911, or 3%, of the employees) have part-time nursing service available. Recreational facilities were provided in 249, or 30%, of the plants employing 236,779, or 58%, of the employees. A tabulation of the number of workers having group insurance, sick benefits and other welfare provisions has been made.

WITH respect to venereal disease control in the defense plants, two facts were determined; namely, presence or absence of a venereal disease control program in each plant, and the opinion of the plant management on the subject of veneral disease control. Sixty-two, or 7%, of the 827 plants whose reports and opinions have been tabulated had a venereal disease control program of one form or another. In some of the plants the program was limited to one of education only, which included the use of posters and the dissemination of venereal disease information. In others the existence of venereal disease was determined in either or both pre-employment and periodic physical examination of employees. Three of these plants made treatment compulsory; one plant maintained a venereal disease clinic for its employees and charged a fee for its services.

In conclusion, industry, and particularly the industrial hygienists, should make an evaluation of those community health problems which may exert a harmful influence on its employees in addition to the recognition and control of specific occupational disease hazards. No health program in industry may be considered complete unless a determination of these factors is made.

Model Course

—In Industrial Hygiene and Occupational Diseases—

NEW YORK UNIVERSITY, Division of General Education, Center for Safety Education, in cooperation with the National Conservation Bureau, in the early part of 1941, established and conducted a course on "Industrial Hygiene and Occupational Diseases," designed to meet the need of physicians, engineers, instructors, and nurses.

The course was divided into 15 units as follows:

1. "Occupational Diseases; their Nature, Incidence and Prevention"—HENRY D. SAYER, Instructor.
2. "Dusts"—LEONARD GREENBURG, M.D., Instructor.
3. "Metallic Poisons"—JOHN M. MACDONALD, M.D., Instructor.
4. "Toxic Gases"—J. B. FICKLEN, Instructor.
5. "Toxic Organic Solvents"—ROY S. BONSIB, Instructor.
6. "Dermatoses and Venereal Disease" — LOUIS SCHWARTZ, M.D., Instructor.
7. "Factors Affecting Industrial Health"—CASSIUS H. WATSON, M.D., Instructor.
8. "Air Sampling and Analyses"—REUEL C. STRATTON, Instructor.
9. "Miscellaneous Exposures and Sick Absenteeism"—JOSEPH G. HARRIS, M.D., Instructor.
10. "Engineering Control Methods"—C. W. SEHL, Instructor.
11. "Personal Protection Equipment"—F. A. PATTY, Instructor.
12. "Ventilation"—B. F. POSTMAN, Instructor.
13. "Plant Surveys, Industrial Processes and Operations"—MYRON A. SNELL, Instructor.
14. "Occupational Diseases and the Law"—J. DEWEY DORSETT, Instructor.
15. "Industrial Health and the Prevention of Occupational Diseases"—A. J. LANZA, M.D., Instructor.

The lectures began on February 3, 1941, and extended through the spring semester. A complete digest of the 15 lectures is presented in a 200-page mimeographed volume which also includes an outline of the course as above, and an extensive bibliography. Copies can be secured from the Publications Department of the School for Safety Education, New York University, 20 Washington Square, N., New York City, at $1.25.

Clean Wounds

THOS. A. LOWE, M.D.,
South St. Paul, Minnesota

WE believe it is generally recognized that clean wounds are infected from too frequent or careless dressings. One means of contamination could be either from the patient's or doctor's respiratory tract.

To guard against this possibility, we conceived

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It has been our privilege for 15 years to have attended large numbers of injuries with the Armour & Company Packing Plant, South St. Paul, Minnesota. We have used this protective glass for some time, and we are well satisfied with it. The patients are very pleased to cooperate and are more conscious of secondary infection, and as a result do not meddle with the dressings as much as previously. We are certain it has reduced our secondary infections.

Industrial Medicine
Reg. U. S. Pat. Off.

The Journal of Traumatic Surgery and Occupational Diseases

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Precedent

EFFORTS to present courses of instruction, "refresher" or otherwise, in matters of industrial medicine and industrial hygiene necessarily involve preliminary analyses and outlines of the general subjects. In any undertaking of this kind, it is helpful to know how these analyses and outlines have been made by others, as well as how they have been filled in. Rarely, if ever, has there been developed a better guide in these respects than the course conducted by New York University, described on page 400. Superlative in form, and comprehensive in substance, it cannot fail to be of outstanding value to any organization planning a similar enterprise.

By special arrangement, we are able to present the full texts of several of the digests. The first of these, "Factors Affecting Industrial Health," by DR. CASSIUS H. WATSON, appears on page 403. In case some readers find it elementary, it may be said that never has there been prepared a better "classification of fundamentals." To those who know DR. WATSON, its excellence will be no more than is to be expected of him. To those who will judge him from it, there must come a better appreciation of the meaning of the kind of industrial medicine he has made his career. In all qualities this is a superb document, a model of clear-headed evaluation.

Even so, however, this lecture is no more than typical of the whole course. The book containing all the lectures is one we can unhesitatingly recommend to everyone who is associated with a plan of the kind it represents.

The next presentation will be DR. JOHN MACDONALD'S "Metallic Poisons," and the third, DR. A. J. LANZA'S "Industrial Health and the Prevention of Occupational Diseases."

Priority

IT IS no doubt consistent with the general trend of thought in these times that there should be priorities of interests as well as of materials. The priority in industrial medicine has emphasized prevention. The term is "industrial health," and this has been, almost literally, on everybody's tongue—with the result that "prevention" is almost as much a shibboleth as "defense," and the curative has been little talked about.

It is imperative, of course, to keep the workers at work. But it is equally important, when they have any kind of disability that prevents them from working to get them back to work. The rising age incidence and the larger number of older people who are taking on one kind of employment or another furnish the basis of more proneness to being sick; while the pressure of activity in all age groups means inevitably more accidents and, by and large, more sickness.

One Medical Director, speaking broadly of the effect of the present intensity of production on his employees, says that in spite of the utmost preventive enterprise the number of accidents and illnesses has increased tremendously. The curative methods, however, have been stepped up, with the over-all outcome that the time lost per case and, therefore, the expense involved, both individually and in the aggregate, have been greatly reduced.

Another evidence of the fact that the need for the curative is increasing right along with the need for the preventive is furnished by a Medical Director in the east whose report for the first four months of 1941, as compared with the same period in 1940, shows an increase of 12,000, or 32%, in the number of employees, with an increase of 128% in the number of sick cases, 74% in disabling accidents, 67% in minor accidents, 68% in surgical treatments, and 49% in medical treatments.

These are unquestionably typical of conditions elsewhere — probably almost everywhere. They mean that prevention should not be given complete priority; the curative measures are entitled at least to a *parity* of interest and attention. The industrial physician can prevent up to a certain point. The general practitioner, however, in most instances, must do the curing — not forgetting withal, that "an ounce of prevention is worth a pound of cure"; that the place to seek that ounce

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Yet, as the tempo of production speeds up, this unseen danger increases. As workers sweat, vitally needed salt is lost from their bodies. Unless promptly replaced, this salt loss results in increased fatigue, more mistakes, a general slowing up. In extreme cases it can cause cramps and heat sickness.

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Morton's modern dispensers deliver salt tablets, one at a time, quickly, cleanly, and without crushing or waste. Sanitary, easily filled — durable and dependable.

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of prevention is in an open-minded acquaintance with the employment conditions characteristic of the community, and an appreciation of the points of view of those who have such conditions in charge; that the maintenance of industrial health requires both prevention *and* cure, cooperatively blended, and that the cooperation that will blend them most effectively, as between all concerned, works both ways.

Lost Man Power

—In Terms of Weapons—

IT becomes increasingly clear that this total war basically is a war of production. It is a war in which the totalitarian system of economics, no less than its political system, is pitted against the democratic. Unless we excel Nazi efficiency in our defense efforts, we shall not survive as a free people. Our machines are the best in the world. It is our task to make our men as good as our machines. In many skills we have already a shortage of manpower. To conserve and improve our manpower is a medical and public health task of national importance.

An obvious first point of attack against needless loss of manpower is in industry itself, particularly in the defense industries. Neal and Bloomfield of the Public Health Service, have estimated that 350 million man days were lost last year on account of illness and accident among industrial workers. This means more than one million men working for a full year. Not all of this loss can be prevented; but suppose we prevented 10% of it—a conservative estimate—what would be the result in defense production? Based on data from the Bureau of Labor Statistics, showing the man-hours required to produce various kinds of war material, I have calculated that a 10% reduction in industrial manpower losses from disability would build 12 cantonments of average size, or five battleships, or 16,407 combat tanks. And how urgently we need them now! Representative McCormack, of Massachusetts, recently made another comparison. He estimates that man-days lost to industry last year on account of disability was 50 times as great as that lost on account of strikes and lockouts. We hear much about the latter but little of the former.

For a quarter century the Public Health Service has been studying health problems in industry, gaining the confidence of labor and management alike through the scientific dispassionateness of its findings. Since 1935 too we have aided 36 states to set up divisions of industrial hygiene. During the past year we have supplemented their work with 15 teams of experts (a doctor, an engineer, and, when needed, a chemist) to survey health hazards in war industries and prescribe corrective measures . . . . This is a beginning, but only a beginning, toward the maximum industrial health efficiency which we must have.

From an article entitled "The Function of Public Health in Defense," by THOMAS PARRAN, M.D., Surgeon-General, U. S. Public Health Service, in *J.A.M.A.*, July 19, 1941.

INDUSTRIAL HEALTH AND DISEASE

Factors Affecting Industrial Health

C. H. WATSON, M.D.,
Medical Director,
American Telephone and Telegraph Company

INDUSTRIAL health seems to have reached a stage in its development, with the physical examination and accident problems well established, where the search for and classification of fundamentals are needed.

The sponsors for this course have suggested a series of topics almost any one of which could occupy the entire assigned time and together with certain other items have lent an unusual stimulus to the imagination of one obliged to adjust a discourse to a 60-minute period. The addition of the occupational disease feature to compensation laws in various parts of the country has intrigued not only governmental agencies but various standardization groups within and without industry to classify causes and effects, and while industrial accidents present problems, they are far easier of comprehension and administration than the occupational diseases.

Individual

THE factors influencing industrial health may be considered under two headings, those concerning the individual and those concerning the individual's environment. The former covers a rather wide range of topics, while the latter must be subjected to a grouping under the subjects of home, transportation, industry, education, economics, etc. Under the items which affect the individual's industrial health, it is but natural to expand the subject to include the topic of physical and mental impairments, their detection and relationship to employability as well as to continuity of employment. Furthermore, there should also be included in a discourse of this sort, the item of treatment, both by direct and indirect therapy, for only under conditions of treatment can industrial health be maintained.

It is to be understood that the employing official functions in the nature of a screen whereby only the acceptable employee, other conditions being equal, is destined to receive a preplacement physical examination. Employability, of course, is a relative thing and may be determined by local job opportunities, the individual's capacity and management's social point of view. Many persons who submit themselves for employment have impairments of different kinds, and acceptability may be standardized under several management policies. Under the old approach to this topic, acquired anatomical impairments were the ones which most often concerned the hiring official, and while there are types of impairments occurring naturally, and where employability certainly exists, nevertheless, these are potentialities capable of profoundly influencing health and must be judged accordingly. Many persons are employable who are variously impaired by certain types of palsies, amputations and contractures of arms or legs which interfere with their usefulness. Yet, these people can play very useful roles in industrial life. All such an-

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atomical impairments, either natural or acquired, may be presented to the employing officials whose observing powers, if they are adequately trained, may in certain instances classify them under requirements imposed by the particular industry as employable, subject to medical approval.

Preplacement physical examinations probably play as large a part in influencing industrial health as any of the activities comprising medical supervision in industry. While the extent to which preplacement examinations is limited must be decided by management, even a brief appraisal is justified. It is needless to go into the details with respect to the limitations which management will have forced upon it, from time to time, such as costs, policy features, etc. Industrial requirements making necessary fully functioning arms and legs would bar the weaknesses of infantile paralysis or the contractures of a spastic paraplegia. And yet, a very brief physical appraisal or one along the most elaborate lines could be justified in terms of the desirability of a particular physical or mental perfection measured in terms of a particular industry. Certain forms of industry can adapt handicapped persons to fulfill productive and valuable roles; even color blindness, vision and hearing defects and some forms of heart disease may be judged employable with respect to their potentialities as menaces to health and safety.

Among the outstanding items as causes of industrial morbidity are the various allergies, many of them congenital, while others have originated through contact with industrial substances, dietary materials or products from areas of infection such as the sinuses, teeth, tonsils, bowel tract, etc. Unfortunately, the allergy-prone individual cannot be uncovered at the time of the preplacement physical examination. The detection of people of this class, and they constitute one of the most costly from the standpoint of morbidity which industry experiences, would be almost impossible under any preplacement schedules. Under both lay and professional health supervision, absenteeism as well as poor production may be traced to such disabling and discomforting agencies. Another item of equal importance and in most instances of equal economic significance is the emotionally susceptible individual. And here also, difficulty is experienced in the detection. This type of impairment, functional in character, is rarely discovered at the time of a preplacement medical examination. However, the alert, trained employment official may often determine from the general appearance of the candidates their psychic instability, tremors, the way in which they respond to questioning as to anti-social tendencies, etc. With proper handling certain desirable individuals may be employable if it is possible to identify the introvert from the extrovert, and the wise personnel assistant should be able to determine whether or not the desirable qualities possessed by such individuals more than counterbalance the potentialities for future emotional disturbances. This demands a comprehension of the monotony, repetition and other constant psychic influences which may be present in a particular type of occupation. Unstable personalities may possess valuable industrial qualities, but continuity of performance may suffer by reason of illness, often more apparent than real, and an unusual judgment must be exercised in determining not only employability but the continuity factor when judging such individuals.

One of the most costly of the morbidity items, experienced under any functional grouping, is that arising out of what might be called constitutional inferiorities. Preplacement physical appraisal is again powerless to isolate such individuals, and again we seek the long time experience of the pre-employment officials who may identify certain talents and estimate them in terms of the advantages which may accrue, even though there may be the hazard of interrupted employment.

The history not only of previous occupation but also of previous disease may have a very definite bearing on employability, and an industrial record serves an important purpose in the detection and treatment of disabilities arising out of or associated with the particiular job. Persons who give a history of rheumatic heart disease should be submitted to a different sort of cardiac scrutiny from individuals who are not recorded as such. The heart examination before employment, under certain conditions, may be exceedingly important and it is here that history must be made to coincide with physical findings and industrial needs. The adjustment of the occasionally disabled cardiac to the requirements of employment demands more in the way of expert technical supervision than do most of the other impairments. Hence, from time to time, the industry itself may be called upon to produce electrocardiographic and other specialized services to determine occupational limits. This is particularly true in those diseases where cardiacs may inadvertently become involved and where certain fumes and gases might be hazardous.

There is little doubt but that the examination of the respiratory system is one of the important features of a preplacement survey. The determination of the individual with a healed tuberculosis or old silicosis is most important from the standpoint of employment records and, furthermore, such findings should have a part in determining the type and place of employment and the safety precautions necessary. The individual with a healed tuberculosis should preferably be employed indoors, under healthful working conditions. A profound factor affecting industrial health may reside in the wise placement of those healed cases of tuberculosis where rest of the lung has been accomplished through pneumothorax or thoracoplasty. Their field of endeavor is limited, yet under proper conditions their morbidity records may be greatly minimized. Individuals with arrested joint tuberculosis present a peculiar hazard in that trauma may play an important part in subsequent prolonged disabilities.

Teeth, tonsils and hernia are commonly given a prominent part in all preplacement programs and are costly items in considering factors affecting industrial health. The maintenance of x-ray records of pulmonary examinations, in preplacement as well as periodic surveys, is now possible on an economic basis through the utilization of a 35 millimeter x-ray film developed by the Westinghouse Electric and Manufacturing Company.

The serological examination of the blood as part of the aggressive and well-established anti-leutic program of the government is well justified. Persons with syphilis should be identified in order that they may be properly placed and routine check-up and care instituted. The individual with a closed syphilis, even if the serological examination is positive, is a perfectly safe person for employment, provided the necessary follow-up with respect to treatment and successive blood examinations is carried out. It is recommended that in all individuals where positive serology is found, regardless of the type of test and in the absence of symptomatology, the blood of such persons be sent to a laboratory for verification, to establish, whether or not the reaction is a normal biological one or truly specific. Such verification tests may be obtained at the Bacteriological Laboratory of the University of Michigan under the guidance of Dr. Reuben Kahn. A liberal policy of management with respect to the employment of leutic individuals should be established at the time of installa- industry's public health responsibility.

The special senses come in for a preplacement scrutiny, as performance with respect to health and safety preservation must largely rest on the degree of effectiveness of the organs of sight and hearing, supplemented, under certain conditions, by those of smell, taste and touch, at home, in transit or on the job. The preplacement physical examination should be considered from the standpoint of adjustment of the individual to the job, not only with respect to the possibilities of accident episodes, but also for the purpose of adjusting the individual in accord with the physical requirements of the task and his or her ability to cope with them in a manner that is safe, from the standpoint of accident as well as health.

The periodic physical examination must be taken into consideration, at

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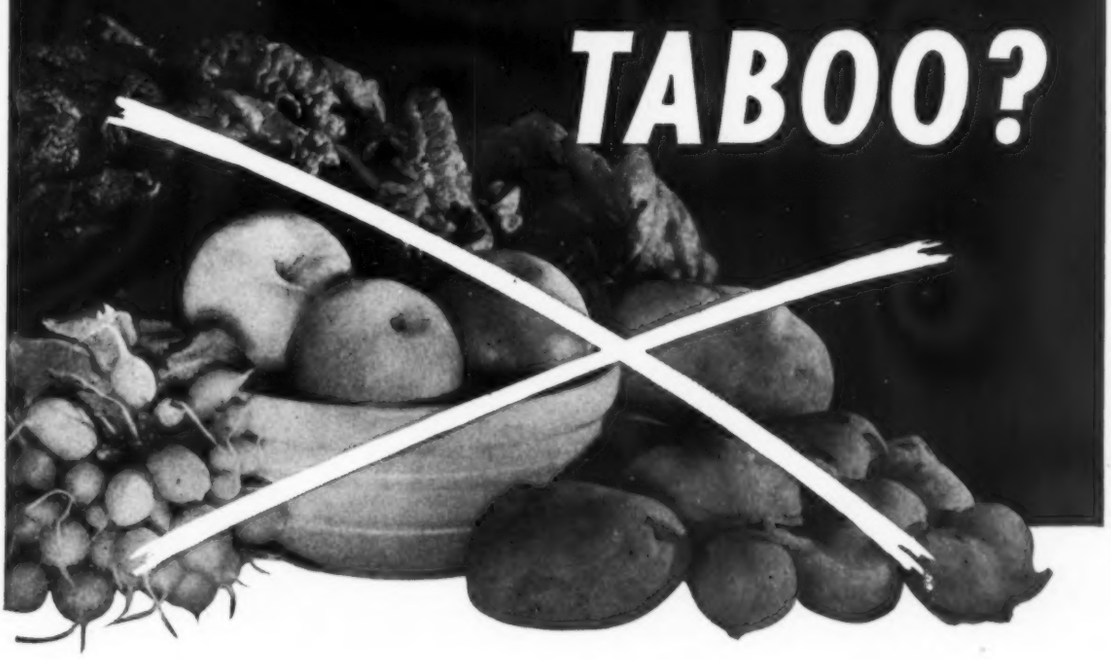

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this time, also as bearing a possible relationship to industrial health. Throughout the younger years, except in individual instances, yearly or birthday examinations should be sufficient. However, there are many employable persons bearing impairments of the teeth, tonsils and the results of infectious episodes, who should be checked, from time to time, depending on the nature and severity of the pathological experience. As a factor concerned in affecting industrial health, examination before return to work following sickness or accident disability is of extreme importance while the type of occupation should demand individual determination of examination dates. Persons who have worked in the presence of known health-hazardous substances or persons working in various of the dusty trades, need consideration more often than others. Then, too, we have the problem of the employees who have reached a certain age, perhaps what is called "middle-life" or somewhat past middle-life, and whose activities have been such as to make them less easily replaced than others. Here are found the individuals who have developed the chronic disabling diseases such as diabetes, nephritis, arthritis or heart disease, and while such employment groups may be relatively small, once this type of disability gets under way, it constitutes large contributions to morbidity. Such persons should be strongly urged to have periodic physical appraisals as well as therapeutic estimates in order to establish drug, dietary and performance routines fitted to their several types of disability. This is particularly important with the insulin treated diabetics and the heart cases which have experienced decompensation.

Periodic examinations should be available to all groups of employees and insisted upon for those possessing impairments of doubtful nature due to illness or accident or who may have given evidence of the ravages of age and manners of living.

One of the problems connected with the periodic physical examinations in industry is that of the potential neurasthenic. Appraisals of this sort may even bring to an otherwise quiet consciousness, disease possibilities of which they were unaware and of which they should not be made cognizant. The periodic physical examination also must be thought of from the standpoint of its extent and cost. Management is the best judge of the extent to which they wish to go in matters of this kind and, often times, has a just query, in view of the fact that morbidity and mortality episodes of extreme gravity sometimes follow the most searching of physical surveys.

Environment

THE second item is that of the environmental factors affecting industrial health. Such a consideration must involve the part played by the home and activities in the home having to do with sickness disability on or off the job. Items of this sort only come to the attention of management with the successful application of personnel supervision and medical investigation. Much of the detail of the factors interfering with industrial health is of such a nature that its elucidation must come from sources which are of the supervisory type. Domestic problems and their effects on workers, both male and female, are not easily discerned by the routine medical survey. Supervisory officials, when trained, can unearth information as to poor adjustment, the dominant characteristics of various members of the family, together with the inadequacies, conflicts, infidelities and the broken relations which so modify the personalities of workers and their abilities to perform. The often resultant dependency on alcohol, drugs, etc., for artificial uplift may, in time, influence performance as well as industrial health. Financial worries, problems in connection with the maintenance of the home and the carrying out of ambitions sometimes exceeding the ability to pay the costs, only too often result in depressions and defeatisms which influence productivity by reason of a complete or partial invalidism which tends to be unusually prolonged.

Then, of course, there are pathological influences such as those which can affect not only the wife and children, but also the occasional personal semi-invalidisms which, known to the worker, may create situations of morbidity and promote a contemplation not only of his own situation, but also of his entire domestic machine that will be unwholesome and opposed to health. These demand careful and diplomatic investigation in matters of an intimacy quite outside of the usual personnel contacts.

Activities outside of the industry, such as those of a social, church and community significance, must be taken into consideration where both supervisory officials as well as medical persons are involved in meeting the problems of industrial health. The home recreational activities must also be borne in mind. "After the whistle blows" there are forms of recreational let-down which may play a part in morbidity on the next day. Undue indulgences not only of hobbies but also of other wholesome activities can be carried to such an extent that resistance may be lowered and sickness episodes supervene. So much for the home environmental features of industrial health.

We now come to that of transportation to and from work, the urge to be on the job, train schedules, the effort to keep appointments, etc. All of these have features of industrial fatigue about them which influence health, particularly in the field of the so-called "anxiety neuroses" often leading to the phobias (job, the boss, other persons).

In the metropolitan areas, where crowds are poorly controlled and physical effort may result in definite fatigue, the stage may be set for all sorts of air-borne and hand-to-mouth forms of infection. This is the common field for the germ-diseases of the upper air passages and also a large part of the influences which give rise to certain of the phobias, particularly those having to do with closed places, cleanliness, personal contacts, etc. We must dismiss the element of transportation to and from work with the statement that, with the long time commuter, under conditions of forced effort there may well reside opportunities for a constitutional breakdown in persons slightly subnormal.

Industrial factors themselves offer, of course, one of the largest fields, and beyond doubt in the character of the work—whether routinized to such an extent as to become fatiguing or where the monotony is carried to the point that initiative seldom functions, or imagination rarely performs—the type of disability generally assumes an emotional disturbance characterized by depressions. The assembly line where the functioning is limited to but a few activities, is often disastrous to certain individuals and the need may arise for a transfer to some other type of job for health reasons.

Working conditions probably are the most important of all agencies affecting industrial health. It is difficult to lay down criteria for all forms of industry. Many have characteristic conditions demanding varied and acute scrutiny. There is the so-called equable normal working temperature of 68° F. applicable to many, perhaps most, industries. On the other hand, where men are working in the presence of molten metal or certain processes where constant temperatures, relatively high, are needful for the proper fabricating of the product, health temperature would be difficult of specific regulation. Lighting may be modified according to requirements, and legislation might well play a part in regulated control. Foot-candle meter inspection and authoritative data from such sources as the research laboratories of the great electric companies leave little guess-work to be done. Humidity must be considered as a very important feature in the maintenance of the so-called working temperature of 68° F. Automatic recording devices, properly installed, give the immediate supervisor information that can be correlated together with sickness absenteeism.

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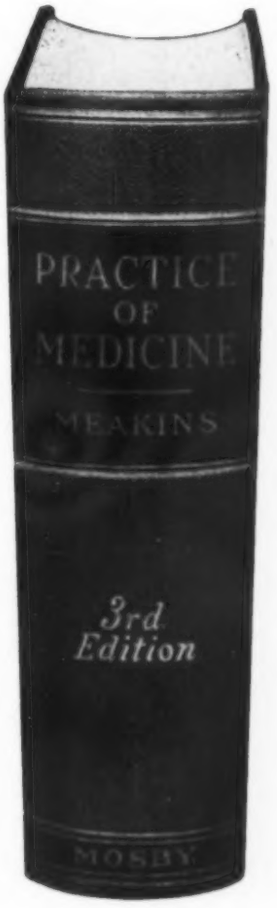

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and a proper heat and moisture condition. Under certain conditions of employment, the refrigeration of air may have a decidedly negative health influence.

Floor-coverings, particularly if a person is working in a standing position, or where transportation of fabricated materials is involved, are most important. Materials of this sort may be covered by engineering specifications. The circulation of warm or cool air just above floor levels plays a part in the maintenance of satisfactory working conditions. Linoleums, oil-impregnated wood blocks and cast plastic materials all must be taken into consideration. The various types of dusts, and perhaps certain oil mists, may make necessary dust or fluid droplet counts. The gases and fumes characteristic of many of our industries, while covered by specifications issued by the American Standards Association under the special committee on permissible limits, may be judged safe on a general basis of 100 parts per million—carbon monoxide, carbon tetrachloride, trichlorethylene, trichlormethane, sulphur dioxide, carbon disulphide. Many of the solvents of the chlorinated hydrocarbon group are so efficient that they cannot easily be dispensed with and, hence, protection must be insured. Automatic recording devices which determine certain atmospheric concentrations of hazardous substances are available in various parts of the country. Preliminary and continuing testing have become a part of the operating routines in all well supervised industry.

Working conditions where noise cannot be avoided, and there are many processes where this is inevitable such as in the weave sheds, foundries, thread and spinning mills, etc., can well be analyzed in terms of sound frequencies. There is a predisposing feature which, while covered in a preplacement examination, is of great importance under conditions of unusual sound and we should call attention to the chronic middle ear disease so often associated with sinus and upper respiratory infections. Here are costly and prolonged factors influencing industrial health classified under the general heading of traumatic shock and industrial neuroses. It is possible, by the use of certain devices, to eliminate sound frequencies which have been found to be injurious, through mechanical modification and the installation of absorbent and sound reflecting walls and partitions. Particularly offensive units may be segregated and, at least, partial isolation accomplished. In rolling and stamping mills effective baffling may prevent many of the brief but disabling nervous disturbances.

Intelligently placed rest periods and proper housekeeping play a large part in the prevention of accidents. Adequate working space with aisles free of raw or finished materials make for a productive urge that cannot be found where accumulations in or about working areas have been allowed to take place. It is impossible to say too much with reference to supervision within the industry and the necessity of holding the minor officials of the supervisory group responsible for the health status of their employees. Where this sort of supervision is slipshod and cursory, it is possible for all sorts of organic situations to arise, while working conditions to which disabilities can be allocated can be responsible for dissatisfaction and may possess the psychic items which lead to labor trouble. Where supervision is only reasonably intelligent, it is possible to produce prolonged and costly periods of morbidity due to lack of understanding on the part of the supervisor and of certain employees.

Many industries have instituted devices for recreation. These may be classified according to acceptability and accessibility, and their elaboration according to their costs. There is no doubt but what opportunity for intervals of relaxation, in the out-of-doors, or under conditions that stimulate freedom from the industrial atmosphere, has much to do in affecting a fatigue already developed or in preventing one which is portending.

Many industries with cafeterias or other eating facilities have an opportunity of profoundly affecting industrial health through wise publicity with respect to dietaries, not only while on the job, but also in the home. They may furnish those educational features which may make it possible for employees to transmit advice to members of their families or others. If by proper display or intriguing prices wholesome items can be selected in preference to tasteful though doubtful ones, there is possible an evident health gain.

In detailing the relationship of medical supervision in industry with respect to industrial health, it is well to bear in mind under this heading the importance of cooperation of engineers, supervisors and physicians. Medical people can function, but in a limited way, unless their activities are intelligently understood by the engineers and supervisory forces, and by this form of cooperation the various types of machinery and devices for handling raw and fabricated products can be scrutinized for their disease- and accident-producing possibilities. This naturally would lead to a definite field of education on the part of the medical personnel of such groups, and while a certain complexity for a time may accrue, nevertheless processes and routines for procedure may be made safer and simpler.

In the present day methods of subdivision of labor where the energies of individuals are directed almost wholly along specific and unchanging lines, such limited scope of performance and confinement to single items of procedure make for a different sort of skill and employment interest. Attention by management must be directed toward varying the procedures and for stimulating personnel regard for the whole finished objective. The use of the multiple drill press serves as an example. Here the training must be exact, but its scope with respect to physical and mental performance is very limited. This type of occupation is duplicated many times in modern machine tool work, once the placing of the work on the standard in proper position is accomplished, the remainder of the operation can be largely automatic. Mechanization makes a multitude of such opportunities for limited, exacting monotony and fatigue. Where instruction is available and repeated shifts are possible to different but adjacent activities, prophylactic barriers can be erected against long, obstinate and disabling occupational neuroses which are so often responsible for high morbidity rates, and a frequent source of sickness morbidity in the personnel equipment, particularly such as is devoted to comfort and safety. Where inorganic and most organic dusts are problems, facilities for changing the clothing and adequately washing add no small complement to health maintenance. As a rule, better results will follow the use of woolen underclothing of appropriate weights under all conditions of heat and cold. Industrial shoes adapted to arch supports and mechanical protection are available to the trade through many manufacturers, as well as safety clothes for protection against heat and hazardous substances, and goggles designed for protection against mechanical hazards and light intensities, all of which are now standard requirements in many industries.

The general subject of the occupational dermatoses has presented one of the largest and most obstinate of the compensable features in industry. These conditions can originate through contact with many raw materials and with chemical substances used for cleaning, dyeing, polishing, etc. The problem here has been met through the use of protective greases and skin coatings of the hands and other exposed parts of the body where conditions can be adjusted to such forms of protection.

Under some circumstances the discovery of hernia and its industrial relationship calls for mechanical support, at times, rather than resort to operative surgical procedures. Adequately fitting trusses, supporting belts, etc., have a very useful and also economic part to play.

Toilet and washing facilities are based on the number of personnel and in a measure on the type of occupation. The law in many states prescribes not only the extent of such facilities but also their location. The National Safety Council and the American Standards Association have produced data on this subject available to all industries. The atmosphere

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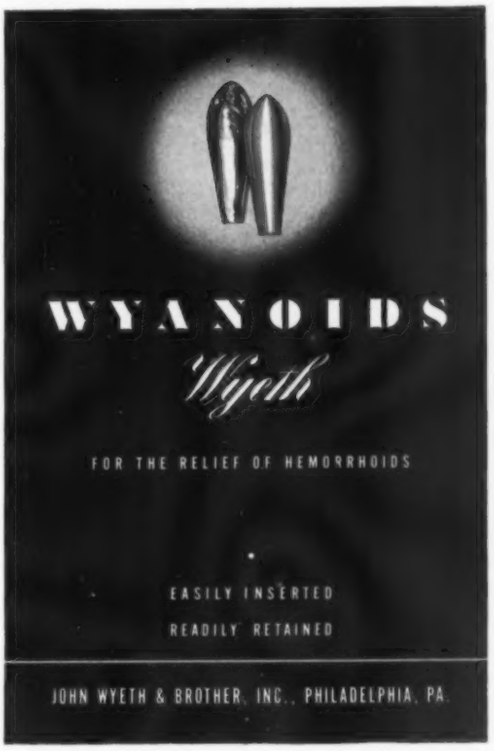

of wholesome cleanliness promotes those normal physiological processes which are so vital to health. If such facilities are limited, unhandy and inconvenient, there will accrue a subtle influence for ill-health the nature of which is quite as potent as any accident hazard.

Industry everywhere must meet the problem of infectious contacts in transit to and from work and on the job. It is foolish to disregard opportunities for disease prevention (health maintenance) simply because the exciting causes may be far from the field of industry. No matter where acquired, the absenteeism and industrial loss is where the job lies. Industrial impairments should become known to the supervisory groups and their correction stimulated. Tonsils, sinuses, teeth and refractive errors are potential sites or avenues through which infectious disease may be attacked. Certain forms of infection such as smallpox, typhoid fever, spotted fever and typhus can have a high degree of protection through vaccination. Recently, the International Health Laboratories have produced a promising virus against influenza. This is being studied, but as yet lacks the approval of the authoritative agencies. Under certain conditions autogenous vaccines may be useful and under extraordinary circumstances industry may well consider paying the bill.

Educational factors, directed at health maintenance, may, under proper supervision, be introduced into industry as definitely prophylactic. In general, industrial populations are not particularly well informed on matters of health consciousness or knowledge of the important departures from normal, etc. Educational efforts should be directed toward the wholesomeness of health as compared with the morbidity of actual pathological states. The American Medical Association, some of the great life insurance companies, the National Safety Council and various governmental agencies have produced, from time to time, posters, movies, pamphlets and fostered lectures in a large measure directed at stimulating thought toward positive health with a minimum of emphasis on actual pathology. In any educational program, the individual who has been returned to industry after some sickness or accident episode presents certain health aspects as respects himself as well as others. There should be established a proper regard for the employee's health in the performance of his duties and fellow-employees may need reassurance as to the propriety of association more or less close. This is particularly true with respect to the arrested tuberculosis, and by that we should mean no signs of activity and a sputum free of tubercle bacilli. Such individuals are non-infectious and the major precautions are under their own control and involve due attention to dietary, fatigue and vigorous, sustained physical or mental activity.

The same may be said of the arrested case of lues or of the case with no open lesion. The continuity of employment should not be modified in either open or closed syphilis except during treatment where open lesions exist. Medical supervision, as we have already mentioned, is essential. Here will reside the means for treatment if activity supervenes or the sinister conditions of cerebro-spinal syphilis develop.

The employee who has suffered a major illness or a minor one with scantily understood symptoms should be examined (more or less briefly) before return to work. Furthermore, the task now begins for the line supervision to observe without objectionable persistency the status quo, from time to time, of such employee. By these means, doubtful performance and personal discomfort may attract attention enough to cause medical check-up and advice.

Industrial establishments are becoming more and more concerned with the inside and outside appearances of the industrial zones. Part of this may be prompted by pride but regardless of motive it is a fact that cleanliness and wholesomeness combined with

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whatever of beauty may be available will indirectly, yet potently, influence health. Wide exposure to sunlight and an outlook worth looking at have not only therapeutic possibilities but also prophylactic ones. All of the educational activities do not center about the employee group but should include management as well. The general level here of health understanding is not greatly above that of the rank and file, and so far as the personal imposition of physical and mental strain on already overworked human machines is concerned, the top management group is guilty.

Hence it is that management must be sold, for here the facts in terms of production and costs must finally be marshalled. It is not sufficient to have convinced management that in the health maintenance picture there is to be found a substantial part of the finished product's cost. This type of understanding, educational in its nature, must be made available to the supervisory groups, for, of course, any measure of this personnel contribution must depend for its initiation and execution on their activities.

The query as to costs is always involved in the installation and operation of medical departments. In planning any health maintenance program under medical supervision, and only under such auspices do we we find the most satisfactory results, there must be plenty of intangible items. The size and scope of this kind of supervision is limited by the character of the industrial project, its size, personnel and nature of its housing, together with the interest of management and its willingess to recognize the importance of morbidity in terms of product costs. The adjustment of the diagnostic and therapeutic procedures to particular needs will require time and judgment.

The average attendance, for all causes, at a medical department in an average industry with an employee body of from 500 persons up, is 1 to 2% of the total population daily. To justify reasonable laboratory equipment including x-ray there must be six to eight cases per day. With but casual time control, the physician should be able to handle from four to five cases an hour and such part-time employment ranges from $2 to $3 per hour.

Nurses can handle an average of six cases per hour, and this service is available at from $28 to $40 a week.

For all sorts of personnel visits to a medical department (for health, sickness or other reasons) it is estimated that floor-space requirements will be satisfied with 10 square feet per employee visitor.

An average management experience will show that supplies, (emergency medication and equipment) cost about two and one-half cents per case. Further than this the general facilities (furniture, telephone, etc.), will be approximately 25 cents per case.

Thus it will be seen that a cost analysis on a service basis, reasonably itemized, is possible when management is considering a limited medical service. It is reasonable to suppose that such costs when studied in the light of an experience of from two to three years may then be adjusted to meet the increases or decreases made necessary by reason of special items peculiar to certain industries and in which it was difficult to make any provisional estimate.

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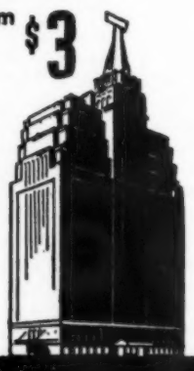

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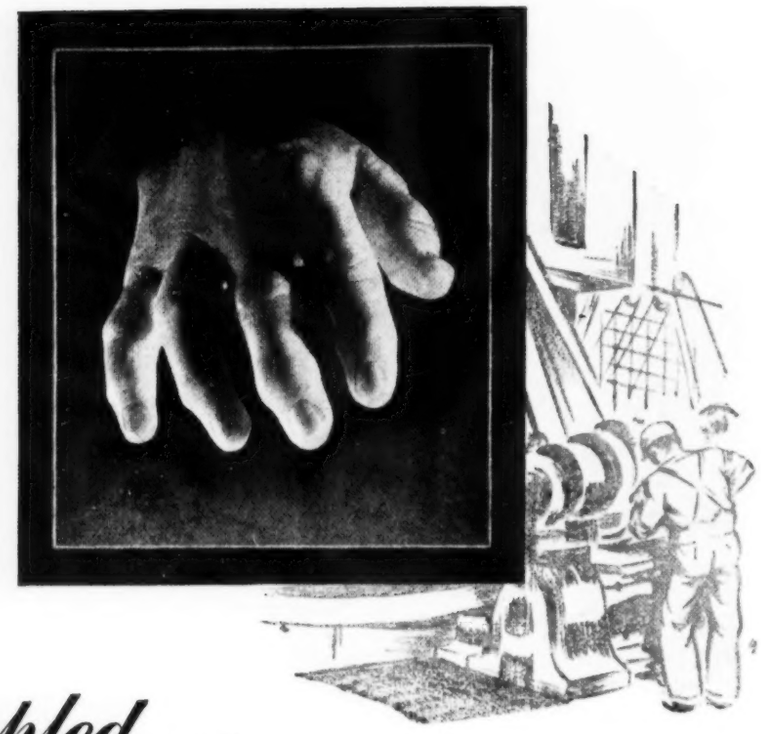

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